

L SYSTEM TEST STANDARD LEAD INS

USER PAGE NO. 1 E0 S4

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0001 REF 15 LAST 242 E5,1671 EBANK= XSM
0002          33,2000 BANK 33
0003 REF 1      04,2000 SETLOC E/PROG
0004          04,2557 BANK
0005 REF 1      COUNT* S3/P07

R0006 SPECIAL PROGRAMS TO EASE THE PANGS OF ERASABLE MEMORY PROGRAMS.

R0007 E/BKCALL FOR DOING BANKCALLS FROM AND RETURNING TO ERASABLE.

R0008 THIS ROUTINE IS CALLABLE FROM ERASABLE OR FIXED. LIKE BANKCALL, HOWEVER, SWITCHING BETWEEN S3 AND S4
R0010 IS NOT POSSIBLE.

R0011 THE CALLING SEQUENCE IS'

A0012 TC BANKCALL
A0013 CADR E/BKCALL
A0014 CADR ROUTINE WHERE YOU WANT TO GO IN FIXED.
A0015 RETURN HERE FROM DISPLAY TERMINATE, BAD STALL OR TC O.
A0016 RETURN HERE FROM DISPLAY PROCEED OR GOOD RETURN FROM STALL.
A0017 RETURN HERE FROM DISPLAY ENTER OR RECYCLE.

R0018 THIS ROUTINE REQUIRES TWO ERASABLES (EBUF2, +1) IN UNSWITCHED WHICH ARE UNSHARED BY INTERRUPTS AND
R0020 OTHER MEMORY PROGRAMS.

R0021 A + L ARE PRESERVED THROUGH BANKCALL AND E/BKCALL.

0022 REF 3 LAST 364 04,2557 52 134 0 E/BKCALL DXCH RUF2 SAVE A,L AND GET DP RETURN.
0023 REF 1          04,2560 52 365 0 DXCH ERUF2 SAVE DP RETURN.
0024 REF 2 LAST 413 04,2561 24 364 0 INCR ERUF2 RETURN +1 BECAUSE DOUBLE CADR.
0025 REF 12 LAST 368 04,2562 3 0006 1 CA FBANK
0026 REF 5 LAST 367 04,2563 7 4747 0 MASK LOW10 GET CURRENT EBANK. (SBANK SOMEDAY)
0027 REF 3 LAST 413 04,2564 28 365 0 ADS ERUF2 +1 FORM BRCQN. (WAS FBANK)
0028 REF 4 LAST 413 04,2565 50 364 0 NDX ERUF2
0029          04,2566 2=7777 0 CA 0 -1 GET CADR OF ROUTINE.
0030 REF 2 LAST 185 04,2567 0 4561 1 TC SWCALL GO TO ROUTINE, SETTING 0 TO SWRETURN
A0031 AND RESTORING A + L.
0032          04,2570 0 2574 0 TC +4 TX 0, V34, OR BAD STALL RETURN.
0033          04,2571 0 2573 1 TC +2 PROCEED OR GOOD STALL RETURN.
0034 REF 5 LAST 413 04,2572 24 364 0 INCR ERUF2 ENTER OR RECYCLE RETURN.
0035 REF 6 LAST 413 04,2573 24 364 0 INCR ERUF2
0036 REF 7 LAST 413 04,2574 52 365 0 E/SWITCH DXCH ERUF2
0037          04,2575 52 006 0 DTCH

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P0038 E/CALL FOR CALLING A FIXED MEMORY INTERPRETIVE SUBROUTINE FROM ERASABLE AND RETURNING TO ERASABLE.

R0040 THE CALLING SEQUENCE IS...

A0041
A0042
A0043
A0044

0045	REF	3	LAST	370	04,2576	22 164 1	E/CALL
0046	REF	45	LAST	376	04,2577	50 001 0	
0047	REF	46	LAST	414	04,2600	3 0001 0	
0048	REF	47	LAST	414	04,2601	24 001 0	
0049	REF	48	LAST	414	04,2602	24 001 0	
0050	REF	6	LAST	413	04,2603	52 365 0	
0051	REF	13	LAST	407	04,2604	0 6006 1	
0052					04,2605	77624 1	
0053	REF	9	LAST	414	04,2606	00364 0	
0054					04,2607	77776 1	
0055	REF	10	LAST	414	04,2610	22 365 1	
0056	REF	14	LAST	414	04,2611	1 6010 1	

RTB

CADR E/CALL
ROUTINETHE INTERPRETIVE SUBROUTINE YOU WANT.
RETURNS HERE IN INTERPRETIVE.

LXCH LOC

ADRES -1 OF CADR.

INDEX L

CA L

CADR IN A.

INCR L

INCR L

RETURN ADRES IN L.

DXCH ERUP2

STORE CADR AND RETURN.

TC

INTPRET

CALL

ERUP2

INDIRECTLY EXECUTE ROUTINE. IT MUST

EXIT

LEAVE VIA RVO OR EQUIVALENT.

LXCH

ERUP2 +1

PICK UP RETURN.

TCP

INTPRET +2

SET LOC AND RETURN TO CALLER



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P0057 E/JOBWAK FOR WAKING UP ERASABLE MEMORY JOBS.

R0058 THIS ROUTINE MUST BE CALLED IN INTERRUPT OR WITH INTERRUPTS INHIBITED.

R0060 THE CALLING SEQUENCE IS:

A0061
A0062
A0063
A0064
A0065
A0066
A0067
A0068
A0069
A0070

INHINT

CA WAKEADR
TC IBKCALL
CADR E/JOBWAK

ADDRESS OF SLEEPING JOB

RETURNS HERE

RELINT

IF YOU DID AN INHINT.

0071 33,2000
0072 REF 2 LAST 413 04,2000
0073 04,2812BANK 33
SETLOC E/PROG
BANK

0074 REF 2 LAST 413 TO 415' 27 27*

COUNT* \$5/P07

0075 REF 3 LAST 377 04,2812 0 5074 1 E/JOBWAK TC JOBWAKE ARRIVE WITH ADRES IN A.
0076 REF 17 LAST 343 04,2813 4 4700 0 CS BIT11
0077 REF 4 LAST 370 04,2814 50 084 0 NDX LOOCTR
0078 REF 4 LAST 414 04,2815 28 184 0 ADS LOC KNOCK FIXED MEMORY BIT OUT OF ADRES.
0079 REF 1 04,2816 0 0072 1 TC RUPTR03 RETURN
R0080 THESE PROGRAMS ARE PROVIDED TO ALLOW OVERLAY OF BANKS 30 THRU 33 OF THE 205 VERSIONS OF SYSTEM TESTS AND
R0062 PRELAUNCH ALIGN. THE INTENT IS TO ALLOW THE STG AND HYBRID LABS TO RUN ALL THE TESTS WITH COLOSSUS.
0084 33,2000 BANK 33
0085 REF 1 33,2000 SETLOC TESTLEAD
0086 33,2000 BANK
0087 REF 1 COUNT 33/CONST
0088 REF 5 LAST 241 E5,1425 EBANK= OPLACE
0089 REF 1 33,2000 0 3425 1 COMPER TC GCOMPER MUST BE 33,2000.
0090 REF 1 33,2001 0 3132 1 GTSCPSS1 TC GTSCPSS MUST BE AT 33,2001
0091 REF 1 33,2002 0 5243 1 REDO TC NEWMODEX DISPLAY MM 07.
0092 33,2003 00007 0 MM 07 FALL INTO INUTEST



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R0010 NAME- IMU PERFORMANCE TESTS 2

R0011 DATE- MARCH 20,1967

R0012 BY- SYSTEM TEST GROUP 864-6900 EXT. 1274

R0013 MODNO.- ZERO

R0014 FUNCTIONAL DESCRIPTION

R0015 POSITIONING ROUTINES FOR THE IMU PERFORMANCE TESTS AS WELL AS SOME OF
R0016 THE TESTS THEMSELVES. FOR A DESCRIPTION OF THESE SUBROUTINES AND THE
R0017 OPERATING PROCEDURES (TYPICALLY) SEE STG MEMO 665 THEORETICAL REF.E-1973

0016				33,2004		BANK 33
0019	REF	1		33,2000		SETLOC IMUCAL
0020				33,2004		BANK
0021	REF	1		E5,1423		ERANK= POSITON
0022	REF	87	LAST	411	33,2004	3 4714 1 IMUTEST CA ZERO
0023	REF	1			33,2005	55*452 1 TS DRIPPT
0024	REF	1			33,2006	55*643 0 TS GEOCOMP1
00241	REF	1			33,2007	3 2443 0 CAF TESTTIME
00242	REF	1			33,2010	55*412 0 TS LENGTHOT
00243	REF	1			33,2011	0 2302 1 TC COALIGN
0025	REF	1			33,2012	3 4734 0 CAF 1SECX
0026	REF	1			33,2013	55*644 1 TS 1SEXT1
00261	REF	1			33,2014	3 2441 1 CA OC14400
00262	REF	7	LAST	301	33,2015	55*074 1 TS 1/PIPADT
0027	REF	15	LAST	414	33,2016	0 6006 1 GUESS TC INTPRET
002701					33,2017	77624 1 CALL
0028	REF	1			33,2020	10617 0 LATAZCHK
0029					33,2021	57546 1 COS DCOMP
0030					33,2022	77752 1 SL1
0031	REF	1			33,2023	16447 1 STODL WANGI
0032	REF	1			33,2024	02403 1 LATITUDE
0033					33,2025	72556 1 SIN SL1
0034	REF	1			33,2026	02445 0 STORE WANGO
0035					33,2027	77776 1 EXIT
0036	REF	59	LAST	391	33,2030	0 4555 0 GEOIMUTT TC BANKCALL
0037	REF	2	LAST	233	33,2031	16516 1 CADR IMUZERO
0038	REF	1			33,2032	0 2316 1 TC IMUSTLLG
0039	REF	68	LAST	416	33,2033	3 4714 1 IMUBACK CA ZERO
0040	REF	1			33,2034	55*421 0 TS NDXCTR
0041	REF	1			33,2035	55*450 0 TS TORQNDX
0042	REF	2	LAST	416	33,2036	55*451 1 TS TORQNDX +1
0043	REF	1			33,2037	3 4375 1 NBPOSPL CA DEC17
0044	REF	1			33,2040	55*655 1 TS ZERONDX1
0045	REF	1			33,2041	3 2445 0 CA XNRADR

TAKE CARE OF DRIFT FLAG

CALCULATE -COS LATITUDE AND SIN LATITUDE

GYROCOMPASS COMES IN HERE



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0046	REF	1		33,2042	0 2356 0	TC	ZEROING
0047	REF	1		33,2043	3 4675 1	CA	HALF
0048	REF	2	LAST 282	33,2044	55=713 1	TS	XNB
0049	REF	16	LAST 416	33,2045	0 6006 1	TC	INTPRET
0050				33,2046	73545 1	DLOAD	SIN
0051	REF	1		33,2047	02401 0		AZIMUTH
0052	REF	2	LAST 282	33,2050	02724 1	STORE	YNB +2
0053	REF	2	LAST 282	33,2051	16734 0	STODL	ZNB +4
0054	REF	2	LAST 417	33,2052	02401 0		AZIMUTH
0055				33,2053	77746 1	COS	
0056	REF	3	LAST 417	33,2054	02726 0	STORE	YNB +4
0057				33,2055	77676 0	DCOMP	
0058	REF	3	LAST 417	33,2056	02732 0	STORE	ZNB +2
00581				33,2057	77776 1	EXIT	
00582	REF	8	LAST 281	33,2060	0 5253 0	TC	CHECKMM
00583				33,2061	00003 1	MM	03
00584				33,2062	1 2064 0	TCF	+2
00585	REF	1		33,2063	1 3432 0	TCF	SETNBPOS +1
00586	REF	17	LAST 417	33,2064	0 6006 1	TC	INTPRET
00587				33,2065	77624 1	CALL	
0059	REF	1		33,2066	47244 0		CALCGA
0060				33,2067	77776 1	EXIT	
0061	REF	60	LAST 416	33,2070	0 4555 0	TC	BANKCALL
0062	REF	2	LAST 235	33,2071	16602 1	CADR	IMUCOARS
0063	REF	35	LAST 377	33,2072	3 4675 1	CAP	BIT14
0064	REF	1		33,2073	7 0077 0	MASK	FLAGWRD3
0065				33,2074	0 0006 1	EXTEND	
0066				33,2075	1 2077 1	BZF	+2
0067	REF	2	LAST 416	33,2076	25=421 1	INCR	NDXCTR
0068	REF	20	LAST 384	33,2077	0 5447 0	TC	DOWNFLAG
0069	REF	1		33,2100	00056 1	ADRES	GLOCKFAIL
0070	REF	2	LAST 416	33,2101	0 2316 1	TC	IMUSTLLG
0071	REF	3	LAST 417	33,2102	11=421 0	CCS	NDXCTR
0072	REF	1		33,2103	0 2131 0	TC	PIPACHK
0074	REF	61	LAST 417	33,2104	0 4555 0	TC	BANKCALL
0075	REF	2	LAST 237	33,2105	17012 1	CADR	IMUFINE
0076	REF	3	LAST 417	33,2106	0 2316 1	TC	IMUSTLLG
0077				33,2107	0 0006 1	EXTEND	
00771	REF	1		33,2110	3 1657 1	DCA	PERFDLAY
00772	REF	1		33,2111	0 5231 1	TC	LONGCALL
00773	REF	2	LAST 416	ES,1423		EBANK=	POSITON
00774	REF	1		33,2112	02116 0	ZCADR	GOESTIMS
00774	REF	1		33,2113	66065 1		
00775	REF	1		33,2114	3 2121 1	CA	ESTICADR
00776	REF	3	LAST 376	33,2115	0 5070 0	TC	JOBSLEEP
00777	REF	2	LAST 417	33,2116	3 2121 1	GOESTIMS	CA
00778	REF	4	LAST 415	33,2117	0 5074 1	TC	JOBWAKE
00779	REF	18	LAST 411	33,2120	0 5213 1	TC	TASKOVER
007791	REF	1		33,2121	66453 0	ESTICADR	CADR

SEE IF IN OPTICAL VERIFICATION
NO
YES

IF BIT14 SET, GIMBAL LOCK

+1 IF IN GIMBAL LOCK, OTHERWISE 0
RESET GIMBAL LOCK FLAG
BIT 14 FLAG 3

IF ONE GO AND DO A PIPA TEST ONLY
ALIGN AND MEASURE VERTICAL PIPA RATE



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0078	REP	69	LAST	416	33,2122	3 4714 1	TORQUE	CA	ZERO	
0079	REP	7	LAST	276	33,2123	55=050 1		TS	DSPTM2	
0080	REP	1			33,2124	3 1514 0		CA	DRIFTI	
0081	REP	8	LAST	418	33,2125	55=051 0		TS	DSPTM2 +1	
0082	REP	3	LAST	417	33,2128	51=423 0		INDEX	POSITON	
0083	REP	2	LAST	96	33,2127	55=430 0		TS	SOUTHER -1	
0084	REP	1			33,2130	0 2427 1		TC	SHOW	
0085	REP	4	LAST	417	33,2131	51=421 1	PIPAQK	INDEX	NDXCTR	PIPA TEST
0086					33,2132	0 2133 1		TC	+1	
0087	REP	1			33,2133	0 2417 1		TC	EARTH*	
0090	REP	1			33,2134	3 4374 0		CA	DEC57	
0091	REP	2	LAST	416	33,2135	55=412 0		TS	LENGTHOT	
0092	REP	55	LAST	409	33,2138	3 4712 1		CA	ONE	
0093	REP	1			33,2137	55=547 1		TS	RESULTCT	
0094	REP	90	LAST	418	33,2140	3 4714 1		CA	ZERO	
0095	REP	1			33,2141	51=422 1		INDEX	PIPINDEX	
0096	REP	2	LAST	266	33,2142	54 037 1		TS	PIPAK	
0097	REP	1			33,2143	55=502 0		TS	DATAPL	
00971	REP	2	LAST	418	33,2144	55=506 1		TS	DATAPL +4	
0098	REP	1			33,2145	0 2321 0		TC	CHECKG	PIP PULSE CATCHING ROUTINE
0099					33,2146	0 0004 0		INHINT		
0100	REP	25	LAST	407	33,2147	3 4711 1		CAP	TWO	
0101	REP	1			33,2150	0 5130 0		TC	TWIDDLE	
0102	REP	16	LAST	413	ES,1671			EBANK=	XSM	
0103	REP	1			33,2151	02153 1		ADRES	PIPATASK	
0105	REP	53	LAST	409	33,2152	0 5112 0		TC	ENDOFJOB	
0106					33,2153	0 0008 1	PIPATASK	EXTEND		
0107	REP	3	LAST	418	33,2154	27=412 0		DIM	LENGTHOT	
01071	REP	4	LAST	418	33,2155	3 1412 1		CA	LENGTHOT	
0108					33,2156	0 0008 1		EXTEND		
0109	REP	1			33,2157	6 2163 1		BZMP	STARTPIP	
0110	REP	26	LAST	381	33,2180	3 4701 0		CAP	BIT10	
0111	REP	2	LAST	416	33,2161	0 5130 0		TC	TWIDDLE	
0112	REP	17	LAST	418	ES,1671			EBANK=	XSM	
0113	REP	2	LAST	416	33,2162	02153 1		ADRES	PIPATASK	
0114	REP	2	LAST	241	33,2163	3 4675 1	STARTPIP	CAP	PRIO20	
0115	REP	15	LAST	410	33,2164	0 5042 1		TC	PINDVAC	
0116	REP	18	LAST	418	ES,1671			EBANK=	XSM	
0117	REP	1			33,2165	02170 0		ZCADR	PIPJOB	
0117	REP	1			33,2166	66065 1				
0118	REP	19	LAST	417	33,2167	0 5213 1		TC	TASKOVER	
0119	REP	5	LAST	418	33,2170	51=421 1	PIPJOB	INDEX	NDXCTR	
0120					33,2171	0 2172 1		TC	+1	
0121	REP	2	LAST	416	33,2172	0 2417 1		TC	EARTH*	
0122	REP	5	LAST	416	33,2173	3 1412 1		CA	LENGTHOT	
0123					33,2174	0 0008 1		EXTEND		
0124					33,2175	6 2177 1		BZMP	+2	
0125	REP	54	LAST	418	33,2176	0 5112 0		TC	ENDOFJOB	
0126	REP	7	LAST	338	33,2177	3 4715 0		CA	FIVE	



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0127	REP	2	LAST	418	33,2200	55=547 1	TS	RESULTCT	
0128	REP	2	LAST	418	33,2201	0 2321 0	TC	CHECKG	
0134					33,2202	0 0008 1	EXTEND		
0135	REP	3	LAST	418	33,2203	4 1503 1	DCS	DATAPL	
0138	REP	4	LAST	419	33,2204	21=507 0	DAS	DATAPL +4	
0137	REP	18	LAST	417	33,2205	0 8008 1	TC	INTPRET	
0138					33,2208	45345 1	DLOAD	DSU	
0139	REP	5	LAST	419	33,2207	02511 0		DATAPL +6	
0140	REP	6	LAST	419	33,2210	02505 0		DATAPL +2	
0141					33,2211	45044 0	SPL	CALL	
0142	REP	1			33,2212	88214 0		AINGOTN	
0143	REP	1			33,2213	88278 1		OVERFFIX	
0144					33,2214	58325 0	AINGOTN	PDOL	
0145	REP	7	LAST	419	33,2215	02507 1		DDV	
0146					33,2218	57212 1	SL4	DMPR	
0147	REP	1			33,2217	27111 0		DEC585	DEC585 HAS BEEN REDEFINED FOR IEM
0148					33,2220	77834 0	RTB		
0149	REP	1			33,2221	45541 0		SQNGREE	
0150	REP	9	LAST	418	33,2222	01051 1	STORE	DSPTM2	
0151					33,2223	77778 1	EXIT		
0152	REP	8	LAST	418	33,2224	11=421 0	CCS	NDXCTR	
0153	REP	2	LAST	418	33,2225	0 2302 1	TC	COALIGN	TAKE PLATFORM OUT OF GIMBAL LOCK
0154	REP	2	LAST	418	33,2228	0 2427 1	TC	SHOW	
0155	REP	1			33,2227	3 2447 1	VERTDRFT	CA	ABOUT 1 HOUR VERTICAL DRIFT TEST
0156	REP	8	LAST	418	33,2230	55=412 0	TS	LENGTHOT	
0157	REP	4	LAST	418	33,2231	51=423 0	INDEX	POSITON	
0158	REP	3	LAST	418	33,2232	4 1427 0	CS	SQUHDR -2	
0159	REP	2	LAST	418	33,2233	55=452 1	TS	DRIFTT	
0160	REP	19	LAST	418	33,2234	3 1875 1	CA	XSM +4	0 IF POSN 4
0161					33,2235	0 0008 1	EXTEND		
0162	REP	1			33,2238	1 2244 0	BZP	PON2	
0163	REP	20	LAST	384	33,2237	4 4708 0	PON4	CS	OFFSET PLATFORM
0164	REP	1			33,2240	27=851 0	ADS	ERCOMP1 +2	
0165	REP	21	LAST	419	33,2241	3 4708 1	CA	BITS	
0166	REP	2	LAST	419	33,2242	27=847 1	ADS	ERCOMP1	
0167	REP	1			33,2243	1 2250 0	TCF	PONG	
0168	REP	22	LAST	419	33,2244	4 4708 0	PON2	CS	
0169	REP	3	LAST	419	33,2245	27=851 0	ADS	ERCOMP1 +2	
0170	REP	23	LAST	419	33,2248	3 4708 1	CA	BITS	
0171	REP	4	LAST	419	33,2247	27=853 1	ADS	ERCOMP1 +4	
0172	REP	3	LAST	418	33,2250	0 2417 1	PONG	TC	EARTHRR*
0173	REP	91	LAST	418	33,2251	3 4714 1	CA	ZERO	ALLOW ONLY SOUTH GYRO EARTH RATE COMPENS
0174	REP	1			33,2252	55=404 1	TS	ERVECTOR	
0175	REP	2	LAST	419	33,2253	55=405 0	TS	ERVECTOR +1	
0176	REP	10	LAST	344	33,2254	3 4672 0	GUESS1	CAP	POS MAX
0177	REP	3	LAST	418	33,2255	55=450 0	TS	TORQNDX	
0178	REP	4	LAST	419	33,2256	55=451 1	TS	TORQNDX +1	
0179	REP	8	LAST	411	33,2257	3 0032 0	CA	CDUX	
0180	REP	2	LAST	98	33,2280	55=413 1	TS	LOSVEC	



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0181	REF	2	LAST	417	33,2261	0 2453 1		TC	ESTIMS	
0184	REF	1			33,2262	3 1512 0	VALMIS	CA	DRIP TO	
0185	REF	10	LAST	419	33,2263	55=051 0		TS	DSPTM2 +1	
0186	REF	92	LAST	419	33,2264	3 4714 1		CA	ZERO	
0187	REF	11	LAST	420	33,2265	55=050 1		TS	DSPTM2	
0188	REF	3	LAST	419	33,2266	0 2427 1		TC	SHOW	
01894	REF	21	LAST	417	33,2267	0 5447 0	ENDTEST1	TC	DOWNFLAG	IMU NOT IN USE
0190	REF	3	LAST	253	33,2270	00007 0		ADRES	IMUSE	BIT 8 FLAG 0
0191	REF	93	LAST	420	33,2271	4 4714 0		CS	ZERO	
0192	REF	2	LAST	415	33,2272	0 5246 1		TC	NEWCODEX +3	
0193	REF	62	LAST	417	33,2273	0 4555 0		TC	BANKCALL	
0194	REF	1			33,2274	16063 0		CADR	MKRELEAS	
0195	REF	18	LAST	391	33,2275	0 5423 1		TC	ENDEXT	

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0196				33,2278	43215 0	OVERFFIX DAD	DAD	
0197	REP	1		33,2277	15340 1		DPPOS MAX	
0198	REP	1		33,2300	27117 0		QNE DDP	
0199				33,2301	77616 0			
0200				33,2302	0 0008 1	COALIGN	EXTEND	COARSE ALIGN SUBROUTINE
0201	REP	6	LAST	415	33,2303	23*425 0	QXCH	OPLACE
0202	REP	94	LAST	420	33,2304	3 4714 1	CA	ZERO
0203	REP	10	LAST	268	33,2305	55*155 0	TS	THETAD
0204	REP	11	LAST	421	33,2306	55*156 0	TS	THETAD +1
0205	REP	12	LAST	421	33,2307	55*157 1	TS	THETAD +2
0206	REP	83	LAST	420	33,2310	0 4555 0	TC	BANKCALL
0207	REP	3	LAST	417	33,2311	16802 1	CADR	IMUCOARS
0208	REP	64	LAST	421	33,2312	0 4555 0	TC	BANKCALL
0209	REP	6	LAST	296	33,2313	17518 0	CADR	IMUSTALL
0210	REP	1			33,2314	0 3103 0	TC	SOMERR2
0211	REP	7	LAST	421	33,2315	0 1425 0	TC	OPLACE
0212					33,2316	0 0008 1	IMUSTILLO	EXTEND
0213	REP	8	LAST	421	33,2317	23*425 0	QXCH	OPLACE
0214	REP	3	LAST	419	33,2320	0 2312 0	TC	COALIGN +10
0215					33,2321	0 0006 1	CHECKG	EXTEND
0216	REP	9	LAST	421	33,2322	23*425 0	QXCH	OPLACE
0217					33,2323	0 2331 1	TC	+6
0218					33,2324	0 0003 1	CHECKG1	RELINT
0219	REP	2	LAST	187	33,2325	3 0087 0	CA	NEWJOB
0220					33,2328	0 0006 1	EXTEND	
02201					33,2327	8 2335 0	BZMF	+6
02202	REP	1			33,2330	0 5057 0	TC	CHANG1
02203					33,2331	0 0004 0	INHINT	
02204	REP	2	LAST	418	33,2332	51*422 1	INDEX	PIPINDEX
02205	REP	3	LAST	418	33,2333	4 0037 1	CS	PIPAX
02208	REP	2	LAST	98	33,2334	55*655 1	TS	ZERONDX
0224					33,2335	0 0004 0	INHINT	
0225	REP	3	LAST	421	33,2336	51*422 1	INDEX	PIPINDEX
0228	REP	4	LAST	421	33,2337	3 0037 0	CA	PIPAX
0227	REP	3	LAST	421	33,2340	8 1655 0	AD	ZERONDX
0226					33,2341	0 0006 1	EXTEND	
0229	REP	1			33,2342	1 2324 1	BZMF	CHECKG1
0230	REP	4	LAST	421	33,2343	51*422 1	INDEX	PIPINDEX
0231	REP	5	LAST	421	33,2344	3 0037 0	CA	PIPAX
0232	REP	3	LAST	419	33,2345	51*547 0	INDEX	RESULTCT
0233	REP	8	LAST	419	33,2348	55*502 0	TS	DATAPL
0234	REP	1			33,2347	0 4526 1	TC	FINETIME
0235	REP	4	LAST	421	33,2350	51*547 0	INDEX	RESULTCT
0238	REP	9	LAST	421	33,2351	55*503 1	TS	DATAPL +1



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0237	REP	5	LAST	421	33,2352	51*547 0	INDEX	RESULT
0236	REP	10	LAST	421	33,2353	23*504 1	LNCH	DATAPL +2
0239					33,2354	0 0003 1	RELINT	
0240	REP	10	LAST	421	33,2355	0 1425 0	ENDORIG	TC OPLACE
0241	REP	49	LAST	414	33,2356	54 001 1	ZEROING	TS L
0242					33,2357	1 2361 0	TCP	+2
0243	REP	2	LAST	416	33,2360	55*655 1	ZEROING1	TS ZERO
0244	REP	95	LAST	421	33,2361	3 4714 1	CAP	ZERO
0245	REP	50	LAST	422	33,2362	50 001 0	INDEX	L
0246					33,2363	54 000 0	TS	0
0247	REP	51	LAST	422	33,2364	24 001 0	INCR	L
0248	REP	3	LAST	422	33,2365	11*655 1	CCS	ZERO
0249	REP	1			33,2366	1 2360 1	TCP	ZEROING1
0250	REP	146	LAST	412	33,2367	0 0002 0	TC	0



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0251	REF	1		32,2000		SETLOC	IMCAL3
0252				32,2000		BANK	
0254				32,2000	65345 0	ERTHRVSE	DLOAD
0255	REF	1		32,2001	27112 0	PDDL	SCHZEROS
0256	REF	2	LAST	416	32,2002	02403 1	LATITUDE
0257				32,2003	57546 1	COS	DCOMP
0258				32,2004	73525 1	PDDL	SIN
0259	REF	3	LAST	423	32,2005	02403 1	LATITUDE
0260				32,2006	74266 0	VDEF	VXSC
0261	REF	1		32,2007	26450 1		OMEG/MS
0262	REF	3	LAST	419	32,2010	02405 1	STORE
0263				32,2011	77634 0	RTB	ERVECTOR
0264	REF	1		32,2012	45505 0		LOADTIME
0265	REF	1		32,2013	26443 0	STOVL	TMARK
0266	REF	2	LAST	423	32,2014	27112 0	SCHZEROS
0267	REF	5	LAST	419	32,2015	02650 0	STORE
0268				32,2016	77616 0	RVO	ERCOMP1
0269	REF	2	LAST	416	33,2000	SETLOC	IMCAL
0270				33,2370		BANK	
0272				33,2370	47020 0	ERTHR	ITA
0273	REF	1		33,2371	00051 0	RTB	S2
0274	REF	2	LAST	423	33,2372	45505 0	LOADTIME
0275	REF	1		33,2373	02441 1	STORE	TEMPTIME
0276				33,2374	51025 1	DSU	BPL
0277	REF	2	LAST	423	33,2375	02443 0	TMARK
0278	REF	1		33,2376	66401 1	ERTHR	
0279				33,2377	77624 1	CALL	
0280	REF	2	LAST	419	33,2400	66276 1	OVERFIX
0281				33,2401	74261 1	SL	VXSC
0282				33,2402	20212 1		90
0283	REF	4	LAST	423	33,2403	02405 1	ERVECTOR
0284				33,2404	53321 1	MXV	VAD
0285	REF	20	LAST	419	33,2405	02672 0	XSM
0286	REF	6	LAST	423	33,2406	02650 0	ERCOMP1
0287	REF	7	LAST	423	33,2407	16650 0	STOVL
0288	REF	2	LAST	423	33,2410	02441 1	ERCOMP1
0289	REF	3	LAST	423	33,2411	02443 0	TEMPTIME
0290				33,2412	47170 1	STORE	TMARK
0291	REF	8	LAST	423	33,2413	02647 0	AXT,1
0292	REF	1		33,2414	45650 0	ECADR	ERCOMP1
0293				33,2415	77650 1		PULSEIMU
0294	REF	2	LAST	423	33,2416	00051 0	GOTO
0295				33,2417	0 0006 1		S2
02951	REF	3	LAST	32	33,2420	23*426 0	EXTEND
02952	REF	19	LAST	419	33,2421	0 6006 1	QXCH
02953				33,2422	77624 1	TC	OPIACES
02954	REF	1		33,2423	66370 0	CALL	INTPRET
02955				33,2424	77776 1		EARTH
02956	REF	4	LAST	417	33,2425	0 2316 1	PRQUT
02957	REF	4	LAST	423	33,2426	0 1426 0	EXIT
						TC	IMUSTLIG
						TC	OPIACES

PD24 = (SIN -COS 0)(OMEG/MS)

CALCULATES AND COMPENSATES EARTH RATE



L IMU CALIBRATION AND ALIGNMENT

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```
0298      33,2427 0 0008 1 SHOW EXTEND
0297 REF 11 LAST 422 33,2430 23*425 0 QXCH QPLACE
0298 REF 5 LAST 419 33,2431 3 1423 0 SHOW1 CA POSITON
0299 REF 12 LAST 420 33,2432 55*052 0 TS DSPTM2 +2
0300 REF 1 33,2433 3 2442 1 CA VSC3N98
0301 REF 65 LAST 421 33,2434 0 4555 0 TC BANKCALL
0302 REF 3 LAST 391 33,2435 20624 0 CADR GFLASH
0304 REF 1 33,2436 0 2267 0 TC ENDTEST1
0305 REF 12 LAST 424 33,2437 0 1425 0 TC QPLACE
0306 REF 1 33,2440 1 2431 1 TCF SHOT1
03061 33,2441 14400 0 OC14400 OCT 14400
0307 REF 2 LAST 423 33,2447 3990DEC = QMB/MS
0308 33,2442 01542 0 VB06N98 VN 0898
0309 33,2443 01602 1 TESTTIME OCT 01602
0310 REF 5 LAST 359 4375 DEC17 = ND1
0311 REF 9 LAST 277 33,2444 02757 0 OGCP L ECADR OGC
0312 REF 1 4734 1SECX = 1SEC
0313 REF 15 LAST 388 4374 DEC57 = VD1
0314 REF 3 LAST 417 33,2445 01713 0 XNBADR GENADR XNB
0315 REF 21 LAST 423 33,2446 01671 0 XSMADR GENADR XSM
0316 33,2447 07623 1 QMBG/MS ZDEC .24339048
0316 33,2450 28552 1
03161 REF 66 LAST 424 33,2451 0 4555 0 P11OUT TC BANKCALL
03162 REF 2 LAST 207 33,2452 70127 1 CADR MATRXJOB
```

V 34
V33

RETURN TO P11

```
03165 REF 1 COUNT 02/CONST
0317 4526 BLOCK 2
0318 4526 0 0004 0 FINETIME INHINT
0319 4527 0 0008 1 EXTEND
0320 REF 1 4530 00 004 0 READ LOSCALAR
0321 REF 52 LAST 422 4531 54 001 1 TS L
0322 4532 0 0008 1 EXTEND
0323 REF 2 LAST 424 4533 06 004 0 RXOR LOSCALAR
0324 4534 0 0008 1 EXTEND
0325 4535 1 4541 1 BZF +4
0326 4536 0 0008 1 EXTEND
0327 REF 3 LAST 424 4537 00 004 0 READ LOSCALAR
0328 REF 53 LAST 424 4540 54 001 1 TS L
0329 REF 11 LAST 419 4541 4 4872 1 +4 CS POS4AX
0330 REF 54 LAST 424 4542 6 0001 0 AD L
0331 4543 0 0008 1 EXTEND
0332 REF 2 LAST 421 4544 1 4527 1 BZF FINETIME +1
0333 4545 0 0008 1 EXTEND
0334 REF 1 4546 00 003 1 READ HISCALAR
0335 REF 147 LAST 422 4547 0 0002 0 TC 0
```

RETURNS WITH INTERRUPT INHIBITED



L IMU CALIBRATION AND ALIGNMENT

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R0336 PROGRAM NAME-OPTIMUM PRELAUNCH ALIGNMENT CALIBRATION

R0337 DATE- NOVEMBER 2 1966

R0338 BY- GEORGE SCHMIDT IL 7-146 EXT. 126

R0339 MOD NO 3

R0340 FUNCTIONAL DESCRIPTION

R0341 THIS SECTION CONSISTS OF PRELAUNCH ALIGNMENT AND GYRO DRIFT TESTS
R0342 INTEGRATED TOGETHER TO SAVE WORDS. COMPASS IS COMPLETELY RESTART
R0343 PROOFED EXCEPT FOR THE FIRST 30 SECONDS OR SO. PERFORMANCE TESTS OF
R0344 THE IRIGS IS RESTART PROOFED ENOUGH TO GIVE 75 PERCENT CONFIDENCE THAT
R0345 IF A RESTART OCCURS THE DATA WILL STILL BE GOOD. GOOD PRACTICE TO RECYCLE
R0346 WHEN A RESTART OCCURS UNLESS IT HAPPENS NEAR THE END OF A TEST-THEN WAIT
R0347 FOR THE DATA TO FLASH.
R03471 A RESTART IN GYROCOMPASS DURING GYRO TORQUING CAUSES PULSES TO BE LOST
R0348 THE PRELAUNCH ALIGNMENT TECHNIQUE IS BASICALLY THE SAME AS IN BLOCK 1
R0349 EXCEPT THAT IT HAS BEEN SIMPLIFIED IN THE SENSE THAT SMALL ANGLE APPROX.
R0350 HAVE BEEN USED. THE DRIFT TESTS USE A UNIQUE IMPLEMENTATION OF THE
R0351 OPTIMUM STATISTICAL FILTER. FOR A DESCRIPTION SEE E-1973. BOTH OF THESE
R0352 ROUTINES USE STANDARD SYSTEM TEST LEADIN PROCEDURES. THE INITIALIZATION
R0353 PROCEDURE FOR THE DRIFT TESTS IS IN THE JDC S. THE INITIALIZATION METHOD
R0354 FOR GYROCOMPASS IS AN ERAS LOAD THEN A MISSION PHASE CALL.
R0355 THE COMPASS ALIGNS TO Z DOWN, X DOWNRANGE, HAS THE CAPABILITY
R0356 CHANGE AZIMUTH WHILE RUNNING, IS COMPENSATED FOR
R0357 COMPONENT ERRORS, IS CAPABLE OF OPTICAL VERIFICATION (CSM ONLY).

R0358 COMPASS ERASABLE LOAD REQUIRED

R0359 1-LAUNCH AZ -DP AZIMUTH IN REV FROM NORTH OF XSM DESIRED (NOM=.2)

R0360 2- LATITUDE -DP-OF LAUNCH PAD

R0361 3- AZIMUTH-DP-OF ZNB OF VEHICLE

R03611 4- IMU COMPENSATION PARAMETERS

R0362 5-AZ AND ELEVATION OF TARGETS 1,2 ****OPTIONAL****

R0363 TO PERFORM AS PART OF COMPASS

R0364 1-OPTICAL VERIFICATION- V 65 E

R0365 2-AZIMUTH CHANGE-V 78 E

R0366 SUBROUTINES CALLED

R0367 DURING OPTICAL VERIFICATION (CSM ONLY) ESSENTIALLY ALL OF INFLIGHT ALIGN
R0368 IS CALLED IN ONE WAY OR ANOTHER. SEE THE LISTING.

R0369 NORMAL EXIT

R0370 DRIFT TESTS- LENGTHOT GOES TO ZERO-RETURN TO IMU PERF TEST2 CONTROL.

R0371 GYROCOMPASS-MANY, SEE THE LISTING

R0372 ALARMS

R0373 1600 OVERFLOW IN DRIFT TEST



L IMU CALIBRATION AND ALIGNMENT

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R0374 1601 BAD IMU TORQUE ABORT
R0375 1802 BAD OPTICS DURING VERIFICATION-RETURN TO COMPASS CSM ONLY

R0378 OUTPUT

R0377 DRIFT TESTS- FLASHING DISPLAYS OF RESULTS-CONTROLLED IN IMU PERF TESTS 2
R0378 COMPASS-PROGRAM MODE LIGHTS TELL YOU WHAT PHASE OF PROGRAM YOU ARE IN
R0379 01 INITIALIZING THE PLATFORM POSITION AND ERASABLE
R0380 02 GYROCOMPASSING
R0381 03 DOING OPTICAL VERIFICATION (CSM)
R0382
R0383
R0384 DEBRIS

R0385 ALL CENTRALS, ALL OF ERANK XSM



L IMU CALIBRATION AND ALIGNMENT

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R0366 MOST OF THE ROUTINES COMMON TO ALIGNMENT AND CALIBRATION APPEAR
R0367 ON THE NEXT FEW PAGES.

03675	REF	1					COUNT	33/P02	
0368	REF	22	LAST	424	E5,1871			EBANK= XSM	
0369					33,2453			BANK 33	
0390	REF	3	LAST	423	33,2000			SETLOC IMUCAL	
0391					33,2453			BANK	
0392	REF	2	LAST	254	33,2453	0 5261 1	ESTIMS	TC 2PHSCHNG	COMES HERE FROM IMU2
0393					33,2454	00075 0		OCT 00075	
03931					33,2455	00004 0		OCT 00004	TURN OFF GROUP 4 IF ON
0394					33,2456	0 0004 0	RSTGTS1	INHINT	COMES HERE PHASE1 RESTART
0395	REF	7	LAST	409	33,2457	3 0025 0		CA TIME1	
0396	REF	1			33,2460	55=645 0		TS GTSWILT1	
0397	REF	98	LAST	422	33,2461	3 4714 1		CAP ZERO	ZERO THE PIPAS
0398	REF	6	LAST	421	33,2462	54 037 1		TS PIPAX	
0399	REF	1			33,2463	54 040 1		TS PIPAY	
0400	REF	1			33,2464	54 041 0		TS PIPAZ	
0402					33,2465	0 0003 1		RELINT	
0403	REF	1			33,2466	3 3130 0		CA 77DECM	ZERO ALL NECESSARY LOCATIONS
0404	REF	4	LAST	422	33,2467	55=655 1		TS ZERONDX1	
0405	REF	1			33,2470	3 3131 1		CA ALX0XZ	
0406	REF	2	LAST	417	33,2471	0 2356 0		TC ZEROING	
0407	REF	20	LAST	423	33,2472	0 6006 1		TC INTPRET	
04064					33,2473	77735 0		SLOAD	
04065	REF	3	LAST	423	33,2474	27112 0		SCHZEROS	
04066	REF	9	LAST	301	33,2475	25477 1		STOVL GCOMP SW -1	
0409	REF	1			33,2476	27123 1		INTVAL +2	LOAD SOME INITIAL DRIFT GAINS
0410	REF	1			33,2477	26455 1		STOVL ALX1S	
0411	REF	4	LAST	427	33,2500	27112 0		SCHZEROS	
0412	REF	17	LAST	301	33,2501	01472 1		STORE GCOMP	
0413	REF	6	LAST	294	33,2502	01163 1		STORE DELVX	GCOMPZER SUBROUTINE NO LONGER NEEDED
0414					33,2503	77776 1		EXIT	
0415	REF	2	LAST	416	33,2504	11=643 0		CCS GECOMP1	NON ZERO IF COMPASS.
0416					33,2505	0 2507 1		TC +2	
0417	REF	1			33,2506	0 2523 1		TC SLEEP1E +1	
0422	REF	21	LAST	427	33,2507	0 6006 1		TC INTPRET	
04221					33,2510	77624 1		CALL	
04222	REF	1			33,2511	64000 0		ERTHRVSE	
04223					33,2512	77776 1		EXIT	
0423	REF	7	LAST	419	33,2513	3 1412 1		CA LENGTHOT	TIMES FIVE IS THE NUM OF SEC ERRECTING
0424	REF	1			33,2514	55=646 0		TS ERRECTIME	
0425	REF	3	LAST	420	33,2515	0 5243 1		TC NEWMODEX	
0426					33,2516	00002 0		MM 02	
0427	REF	67	LAST	424	33,2517	0 4555 0		TC BANKCALL	SET UP PIPA FAIL, TO CAUSE ISS ALARM



ASSEMBLE REVISION 249 OF AGC PROGRAM COLOSSUS BY NASA 2021111-041

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0428 REP 2 LAST 301 33,2520 17075 0
0429 REP 1 33,2521 0 3376 0

CADR PIPUSE
TC ANNNNN

COMPASS NEVER TURNS THIS OFF
END OF FIRST TIME THROUGH



L IMU CALIBRATION AND ALIGNMENT

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R0430 COMES HERE AT THE END OF EVERY ITERATION THROUGH DRIFT TEST OR COMPASS

R0431 SET UP WAITLIST SECTION

0432	REF	8	LAST	427	33,2522	55=412 0	SLEEP	TS	LENGHOT	TEST NOT OVER-DECREMENT LENGHOT
0433	REF	7	LAST	385	33,2523	0 5301 0		TC	PHASCHG	CHANGE PHASE
0434					33,2524	00135 0		OCT	00135	
0435	REF	5	LAST	419	33,2525	11=450 0		CCS	TORNDX	ARE WE DOING VERIDRIFT
0436	REF	4	LAST	419	33,2526	0 2417 1		TC	EARTH*	TRUE TORQUE SOUTH GYRO
0437	REF	1			33,2527	0 3401 1	WTLIST	TC	CHKCMED	SEE IF COMPASS OVER
04371	REF	1			33,2530	0 2532 1		TC	SETGLST	
04372	REF	55	LAST	418	33,2531	0 5112 0		TC	ENDOFJOB	
04373					33,2532	0 0006 1	SETGLST	EXTEND		
04374	REF	218	LAST	398	33,2533	22 154 1		QXCH	MPAC	CALLED EVERY WAITLIST OR AZIMUTH CHANGE
0438					33,2534	0 0004 0		INHINT		
0439	REF	8	LAST	427	33,2535	4 0025 1		CS	TIME1	
0440	REF	2	LAST	427	33,2536	6 1645 1		AD	GTSWILT1	
0441					33,2537	0 0008 1		EXTEND		
0442					33,2540	6 2542 0		BZMP	+2	
0443	REF	2	LAST	409	33,2541	6 4674 0		AD	NEGMX	10 MS ERROR OK
0444	REF	2	LAST	416	33,2542	8 1644 0		AD	1SEXT1	1 SEC FOR CALIBRATION, .5 SEC IN COMPASS
0445					33,2543	0 0006 1		EXTEND		
0446	REF	1			33,2544	6 2550 0		BZMP	RIGHTGTS	
0447	REF	3	LAST	418	33,2545	0 5130 0	WGTSMPL	TC	TWIDDLE	
0448	REF	1			E5,1540			EBANK=	ALTIM	
0449	REF	1			33,2546	02575 1		ADRES	ALLOOP	
0451	REF	219	LAST	429	33,2547	0 0154 1		TC	MPAC	
0452	REF	7	LAST	355	33,2550	3 4710 0	RIGHTGTS	CAP	FOUR	SET UP NEXT WAITLIST-ALLOW SOME TIME
0453	REF	1			33,2551	0 2545 1		TC	WGTSMPL	END OF WAITLIST SECTION
R0454	STORE AND LOAD DATA SECTIONS FOR RESTART PROOPING									
0455					33,2552	00031 0	25DECM	DEC	25	
0458	REF	1			33,2553	3 2552 1	STOREDTA	CAP	25DECM	
0457	REF	220	LAST	429	33,2554	54 154 0		TS	MPAC	
0456	REF	221	LAST	429	33,2555	50 154 1		INDEX	MPAC	
0459	REF	2	LAST	98	33,2556	31=460 1		CAB	THETAX1	
0460	REF	222	LAST	429	33,2557	50 154 1		INDEX	MPAC	
0461	REF	1			33,2560	55=577 1		TS	RESTARTPT	
0462	REF	223	LAST	429	33,2561	10 154 0		CCS	MPAC	
0463	REF	1			33,2562	1 2554 0		TCF	STOREDTA +1	
0464	REF	148	LAST	424	33,2563	0 0002 0		TC	0	
0465	REF	2	LAST	429	33,2564	3 2552 1	LOADSTDT	CAP	25DECM	
0466	REF	224	LAST	429	33,2565	54 154 0		TS	MPAC	
0467	REF	225	LAST	429	33,2566	50 154 1		INDEX	MPAC	
0468	REF	2	LAST	429	33,2567	3 1577 0		CA	RESTARTPT	



L IMU CALIBRATION AND ALIGNMENT

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0469 REP 226 LAST 429 33,2570 50 154 1 INDEX MPAC
0470 REP 3 LAST 429 33,2571 55=460 0 TS THSDAX1
0471 REP 227 LAST 430 33,2572 10 154 0 CCS MPAC
0472 REP 1 33,2573 1 2565 1 TCF LOADSTDT +1
0473 REP 149 LAST 429 33,2574 0 0002 0 TC 0
R0474 COMES HERE EVERY ITERATION BY A WAITLIST CALL SET IN SLEEPER

0475 REP 9 LAST 429 33,2575 3 0025 0 ALLOOP CA TIME1
0476 REP 3 LAST 429 33,2576 55=645 0 TS OTSSTLT1
0477 REP 2 LAST 429 33,2577 3 1540 1 ALLOOP3 CA ALTIM
0478 REP 1 33,2600 55=631 0 TS GEOSAVE1
0479 REP 6 LAST 429 33,2601 0 5301 0 TC PHASCHNG
0480 33,2602 00115 1 OCT 00115
0481 REP 2 LAST 430 33,2603 31=631 1 ALLOOP1 CAE GEOSAVE1
0482 REP 3 LAST 430 33,2604 55=540 0 TS ALTIM
0483 REP 130 LAST 409 33,2605 10 000 0 CCS A
0484 REP 131 LAST 430 33,2606 3 0000 1 CA A
0485 REP 1 33,2607 55=541 1 TS ALTIMS
0486 REP 132 LAST 430 33,2610 4 0000 0 CS A
0487 REP 4 LAST 430 33,2611 55=540 0 TS ALTIM
0488 REP 97 LAST 427 33,2612 3 4714 1 CAP ZERO
04881 REP 7 LAST 427 33,2613 56 037 0 XCH PIPAX
0489 REP 7 LAST 427 33,2614 55=162 1 TS DELVX
0490 REP 96 LAST 430 33,2615 3 4714 1 CAP ZERO
04901 REP 2 LAST 427 33,2616 56 040 0 XCH PIPAY
0491 REP 4 LAST 294 33,2617 55=164 1 TS DELVY
0492 REP 99 LAST 430 33,2620 3 4714 1 CAP ZERO
04921 REP 2 LAST 427 33,2621 56 041 1 XCH PIPAZ
0493 REP 3 LAST 295 33,2622 55=166 0 TS DELVZ
0494 REP 1 33,2623 3 4374 0 CAP 19DECM
0495 REP 1 33,2624 0 4114 1 TC NEWPHASE
0496 33,2625 00005 1 OCT 00005
0501 REP 3 LAST 416 33,2626 3 4675 1 SPECSTS CAP PRIO20
0502 REP 16 LAST 416 33,2627 0 5042 1 TC FINDVAC
0503 REP 3 LAST 430 E5,1631 BRANK= GEOSAVE1
0504 REP 1 33,2630 02633 0 ZCADR ALFLT
0504 REP 1 33,2631 66065 1
0505 REP 20 LAST 416 33,2632 0 5213 1 TC TASKOVER

STORE TIME TO SET UP NEXT WAITLIST.

SHOULD NEVER HIT THIS LOCATION

23 OCT

START THE JOB

L IMU CALIBRATION AND ALIGNMENT

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05006 THIS IS PART OF THE JOB DONE EVERY ITERATION

0507	REF	2	LAST	429	33,2633	0 2553 0	ALFLT	TC	STOREDTA
0508	REF	9	LAST	430	33,2634	0 5301 0		TC	PHASCHNG
0509					33,2635	00215 1		OCT	00215
0510					33,2636	1 2640 0		TCF	+2
0511	REF	2	LAST	430	33,2637	0 2564 1	ALFLT1	TC	LOADSTD
0512	REF	3	LAST	427	33,2640	11-843 0		CCS	GEOCOMP1
0513					33,2641	0 2643 1		TC	+2
0514	REF	1			33,2642	0 2646 1		TC	NORMLOP
0515	REF	2	LAST	429	33,2643	0 3401 1		TC	CHKCOMED
0516	REF	68	LAST	427	33,2644	0 4555 0		TC	BANKCALL
0517	REF	1			33,2645	15262 0		CADR	1/PIPA
0518	REF	22	LAST	427	33,2646	0 6006 1	NORMLOP	TC	INTPRET
0519					33,2647	77745 1		DLOAD	
0520	REF	2	LAST	427	33,2650	27121 0			INTVAL
0521	REF	5	LAST	403	33,2651	24051 0		STOVL	S1
0522	REF	8	LAST	430	33,2652	01163 1			DELUX
0523					33,2653	76505 0		VXM	VSL1
0524	REF	23	LAST	427	33,2654	02672 0			XSM
0525					33,2655	57545 1		DLOAD	DCOMP
0526	REF	228	LAST	430	33,2656	00160 0			MPAC +3
0527	REF	1			33,2657	16533 0		STOOL	DPIPAY
0528	REF	229	LAST	431	33,2660	00162 1			MPAC +5
0529	REF	1			33,2661	02537 1		STORE	DPIPAZ
0530					33,2662	76001 1		SETPD	AXT,1
0531					33,2663	00001 0			0
0532					33,2664	00010 0			8D
0533					33,2665	57535 0		SLOAD	DCOMP
0534	REF	4	LAST	431	33,2666	02644 0			GEOCOMP1
0535					33,2667	77640 0		RVN	
0536	REF	1			33,2670	67203 1			ALWAYS

STORE DATA IN CASE OF RESTART IN JOB
THIS IS THE JOB DONE EVERY ITERATION

COMES HERE ON RESTART

SEE IF PRELAUNCH OVER
COMPENSATION IF IN COMPASS

DO A QUICK COMPASS



L IMU CALIBRATION AND ALIGNMENT

USER'S PAGE NO. 17 E5 S3

R0537 NOW WE HAVE JUST THE CALIBRATION PARTS OF THE PROGRAM-NEXT PAGES

05375	REP	2	LAST	415	TO	424'	314	314*	COUNT	33/CONST
0538						33,2671	50135	0	ALCKK	SLOAD RMN
0539	REP	2	LAST	430		33,2672	02542	0		ALTIMS
0540	REP	1				33,2673	66706	0		ALFLT3
0541						33,2674	72174	0	ALKCG	LXA,1
0542						33,2675	00014	1		12D
0543	REP	2	LAST	427		33,2676	02454	0		ALX1S
0544						33,2677	62143	0	ALKCG2	DLOAD* INCR,1
0545	REP	1				33,2700	02243	0		ALFDK +144D,1
0546						33,2701	77775	1	DEC	-2
0547	REP	1				33,2702	12555	1	STORE	ALDK +10D,2
0548						33,2703	66104	1	TIX,2	SXA,1
0549	REP	1				33,2704	66677	1		ALKCG2
0550	REP	3	LAST	432		33,2705	02454	0		ALX1S
0551						33,2706	77770	1	ALFLT3	AXT,1
0552						33,2707	00010	0		8D
0553						33,2710	41343	0	DELM LP	DLOAD* DMP
0554	REP	2	LAST	431		33,2711	02543	1		DPIPAY +8D,1
0555	REP	1				33,2712	27675	0		PIPASC
0556						33,2713	43661	1	SLR	BDSU*
0557						33,2714	21212	0		9D
0558	REP	1				33,2715	02511	0		INTY +8D,1
0559	REP	2	LAST	432		33,2716	06511	1	STORE	INTY +8D,1
0560						33,2717	40725	0	PODL	DMP*
0561	REP	1				33,2720	27677	1		VELSC
0562	REP	1				33,2721	02531	1		VLAUN +8D,1
0563						33,2722	77732	1	SL2R	
0564						33,2723	45425	0	DSJ	STADR
0565	REP	1				33,2724	71206	0	STORE	DELM +8D,1
0566	REP	2	LAST	432		33,2725	06573	0	STORE	DELM +10D,1
0567						33,2726	77100	0	TIX,1	AXT,2
0568	REP	1				33,2727	66710	1		DELM LP
0569						33,2730	00004	0		4
0570						33,2731	56743	1	ALILP	DLOAD* DMPR*
0571	REP	3	LAST	96		33,2732	75314	0		ALK +4,2
0572	REP	2	LAST	432		33,2733	75230	1		ALDK +4,2
0573	REP	4	LAST	432		33,2734	12463	0	STORE	ALK +4,2
0574						33,2735	77104	1	TIX,2	AXT,2
0575	REP	1				33,2736	66731	1		ALILP
0576						33,2737	00010	0		8D
0577						33,2740	66140	1	ALKLP	LXC,1
0578	REP	1				33,2741	02455	1		SXA,1
0579	REP	2	LAST	432		33,2742	02455	1		CMPX1
0580						33,2743	56743	1		CMPX1
0581	REP	5	LAST	432		33,2744	02460	1	DLOAD*	DMPR*
0582	REP	3	LAST	432		33,2745	75206	1		ALK +1,1
										DELM +8D,2

NO NEW GAINS NEEDED
LOADS SLOPES AND TIME CONSTANTS AT ROSTMEASUREMENT INCORPORATION ROUTINES
AND GAIN UPDATES



L IMU CALIBRATION AND ALIGNMENT

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0583 33,2746 77613 0
0584 REF 3 LAST 432 33,2747 75268 1
0585 REF 4 LAST 433 33,2750 12511 1
0586 33,2751 42743 1
0587 REF 6 LAST 432 33,2752 75304 1
0588 REF 3 LAST 432 33,2753 75220 0
0589 REF 7 LAST 433 33,2754 12473 1
0590 33,2755 42673 0
0591 REF 4 LAST 432 33,2756 75206 1
0592 REF 5 LAST 433 33,2757 75256 1
0593 REF 6 LAST 433 33,2760 12521 1
0594 33,2761 40743 0
0595 REF 1 33,2762 27702 1
0596 REF 5 LAST 433 33,2763 75206 1
0597 33,2764 42772 0
0598 REF 2 LAST 432 33,2765 75246 0
0599 REF 3 LAST 433 33,2766 12531 0
0600 33,2767 76104 0
0601 REF 1 33,2770 66740 1
0602 33,2771 00010 0
0603 33,2772 64743 0
0604 REF 1 33,2773 02533 0
0605 REF 4 LAST 433 33,2774 02531 1
0606 33,2775 55523 0
0607 REF 1 33,2776 02541 0
0608 33,2777 76521 0
0609 REF 2 LAST 90 33,3000 02001 1
0610 33,3001 77745 1
0611 REF 230 LAST 431 33,3002 00155 0
0612 REF 2 LAST 433 33,3003 06541 1
0613 33,3004 77745 1
0614 REF 231 LAST 433 33,3005 00160 0
0615 REF 5 LAST 433 33,3006 06531 0
0616 33,3007 77745 1
0617 REF 232 LAST 433 33,3010 00162 1
0618 REF 2 LAST 433 33,3011 06533 1
0619 33,3012 77700 0
0620 REF 1 33,3013 66772 0
0621 33,3014 76174 1
0622 33,3015 00006 1
0623 33,3016 00002 0
0624 33,3017 57343 1
0625 REF 1 33,3020 02513 1
0626 REF 1 33,3021 27705 0
0627 33,3022 77722 0
0628 33,3023 73406 1

DAD*
INTY +8D,2
STORE INTY +8D,2
DLOAD* DAD*
ALK +12D,2
ALDK +12D,2
STORE ALK +12D,2
DMPR* DAD*
DELM +8D,2
INTY +16D,2
STORE INTY +16D,2
DLOAD* DMP*
ALSK +1,1
DELM +8D,2
SL1R DAD*
VLAUN +8D,2
STORE VLAUN +8D,2
TIX,2 AXT,1
ALKLP
8D
DLOAD* PDDL*
ACCD +8D,1
VLAUN +8D,1
PDDL* VDEF
POSNV +8D,1
MXV VSL1
TRANS*1
DLOAD
MPAC
STORE POSNV +8D,1
DLOAD
MPAC +3
STORE VLAUN +8D,1
DLOAD
MPAC +5
STORE ACCWD +8D,1
TIX,1
LOOSE
AXT,2 AXT,1
6
2
DLOAD* DMPR
ANGX +2,1
GEORGEJ
SR2R
PUSH SIN

LOOSE

EXTRAPOLATE SWAY VARIABLES

HOOP

EVALUATE SINES AND COSINES



L IMU CALIBRATION AND ALIGNMENT

USER-S PAGE NO. 19 E5 S3

0629				33,3024	56072 1	SL3R	XAD,1
0630	REP	1		33,3025	00046 0		X1
0631				33,3026	10021 0	STORE	16D,2
0632				33,3027	77745 1	DLOAD	
0633				33,3030	77746 1	COS	
0634				33,3031	10027 0	STORE	22D,2
0635				33,3032	77704 1	TIX,2	
0636	REP	1		33,3033	67017 0		BOOP
0637				33,3034	77776 1	PERFERAS	EXIT
0638	REP	2	LAST	252	33,3035	3 4753 1	CA
0639	REP	5	LAST	275	57,1400		EBANK
0639S	REP	18	LAST	372	33,3036	54 003 0	EBANK= LAT(SPL)
0640	REP	6	LAST	434	33,3037	0 1400 1	TS
							EBANK
							TC
							LAT(SPL)

COSINES

GO TO ERASABLE ONLY TO RETURN

R0641 CAUTION

R0642 THIS ERASABLE PROGRAM THAT DOES THE CALCULATIONS MUST BE LOADED
R0643 BEFORE ANY ATTEMPT IS MADE TO RUN THE IMU PERFORMANCE TEST

0734	REP	9	LAST	429	E5,1412		EBANK=	LENGTHOT
0735	REP	10	LAST	434	33,3040	11=412 0	ONCEMORE	CCS
0736	REP	2	LAST	427	33,3041	0 2522 0	TC	SLEEPIE
07361	REP	6	LAST	429	33,3042	11=450 0	CCS	TORQNDX
07362					33,3043	1 3045 1	TCF	+2
07363	REP	1			33,3044	0 3047 1	TC	SETUPER1
07364	REP	9	LAST	419	33,3045	3 0032 0	CA	CDUX
07365	REP	3	LAST	419	33,3046	55=414 0	TS	LOSVEC +1
0737	REP	23	LAST	431	33,3047	0 6006 1	SETUPER1	TC
0736					33,3050	65345 0	DLOAD	INTPRET
0739	REP	1			33,3051	02503 0		PDDL
0740	REP	1			33,3052	02507 1		ANGZ
0741					33,3053	55525 0	PDDL	ANGY
0742	REP	2	LAST	433	33,3054	02511 0		VDEF
0743					33,3055	74276 1	VCOMP	ANGX
0744	REP	2	LAST	433	33,3056	27705 0		VXSC
0745					33,3057	74521 1		GEORGEJ
0746	REP	24	LAST	431	33,3060	02672 0	MXV	VSR1
0747	REP	10	LAST	424	33,3061	02760 1		XSM
0746					33,3062	77776 1	STORE	OCG
							EXIT	
0749	REP	10	LAST	431	33,3063	0 5301 0	TORQINCH	TC
0750					33,3064	00005 1		PHASCHNG
0751	REP	1			33,3065	3 2444 1	OCT	00005
0752	REP	69	LAST	431	33,3066	0 4555 0	CA	OCOP
0753	REP	3	LAST	296	33,3067	17125 1	TC	BANKCALL
0754	REP	5	LAST	423	33,3070	0 2316 1	CADR	IMPULSE
0755	REP	7	LAST	434	33,3071	11=450 0	TC	IMUSTILLG
0756	REP	1			33,3072	0 2262 0	CCS	TORQNDX
0757	REP	24	LAST	434	33,3073	0 6006 1	TC	VALMIS
								INTPRET

TEST NOT OVER SET UP NEXT WAITLIST

FOR TROUBLESHOOTING POSYS 254 VD
DRIFT TEST OVER
ANGLES FROM DRIFT TEST ONLY

+ IF IN VERTICAL DRIFT TEST
VERT DRIFT TEST OVER



L IMU CALIBRATION AND ALIGNMENT

USER'S PAGE NO. 20 ES S3

07571 33,3074 77624 1 CALL
07572 REF 2 LAST 427 33,3075 64000 0 ERTHRVSE SET UP ERATE FOR PIP TEST OR COMPASS
07573 33,3076 77776 1 EXIT
0756 REF 1 33,3077 0 2122 1 TC TORQUE
0759 REF 21 LAST 251 33,3100 0 5537 0 SOMEZERR TC ALARM GO TO IMU2 FOR A PIPA TEST AND DISPLAY
0760 33,3101 01600 0 OCT 1600
0761 33,3102 0 3105 0 TC +3
0762 REF 22 LAST 435 33,3103 0 5537 0 SOMERR2 TC ALARM
0763 33,3104 01601 1 OCT 1601
0764 REF 11 LAST 434 33,3105 0 5301 0 TC PHASCHNG
0765 33,3106 00005 1 OCT 00005
0766 REF 2 LAST 424 33,3107 0 2267 0 TC ENDTEST1
R0767 THE FAMOUS MAGIC NUMBERS OF SCHMIDT ARE NOW PART OF AN ERASABLE LOAD.
0766 33,3110 02222 1 DEC565 OCT 02222 1170 B+14 ORDER IS NOW IMPORTANT
0769 33,3111 00000 1 SCHZEROS 2DEC .00000000
0769 33,3112 00000 1 2DEC .00000000
0770 33,3113 00000 1 2DEC .00000000
0770 33,3114 00000 1
0771 33,3115 00000 1 OCT 00000
0772 33,3116 00000 1 QNEDPP OCT 00000
0773 33,3117 00001 0 OCT 00001
0774 33,3120 00004 0 INTVAL OCT 4 ABOVE ORDER IS IMPORTANT
0775 33,3121 00002 0 OCT 2
0776 33,3122 00220 1 DEC 144
0777 33,3123 77776 1 DEC -1
0776 33,3124 35730 0 SOUPLY 2DEC .93505670 INITIAL GAINS FOR PIP OUTPUTS
0776 33,3125 00035 1 2DEC .26266423 INITIAL GAINS/4 FOR ERECTION ANGLES
0779 33,3126 10317 0
0779 33,3127 17550 1
0760 33,3130 00115 1 77DECML DEC 77
0761 REF 4 LAST 432 33,3131 01453 1 ALXXXZ GENADR ALX1S -1
R0769 GYROCOMPASS PORTIONS FINISH THIS LOG SECTION
07695 REF 1 COUNT 33/P01

R0790 INITIALIZATION SECTION

0791 REF 56 LAST 416 33,3132 3 4712 1 GTSCPSS CAP ONE CALLED BY V37.
0792 REF 5 LAST 431 33,3133 55-643 0 TS GECCOMP1 THIS IS THE LEAD IN FOR COMPASS.



L IMU CALIBRATION AND ALIGNMENT

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0793	REP	1		33,3134	3 3424 0	CA	1/PIPAGT	
0794	REP	8	LAST	416	33,3135	55=074 1	TS	1/PIPADT
0795	REP	21	LAST	298	33,3136	3 4703 1	CA	BIT8
0796	REP	11	LAST	434	33,3137	55=412 0	TS	LENGTH
0797	REP	1			33,3140	3 4731 0	CAP	1/2SECC
0798	REP	3	LAST	429	33,3141	55=644 1	TS	1SECC1
0799	REP	57	LAST	435	33,3142	3 4712 1	CAP	ONE
0800	REP	1			33,3143	55=632 0	TS	PREMTRX1
08005	REP	2	LAST	417	33,3144	55=657 0	TS	PERFDLAY +1
08006	REP	100	LAST	430	33,3145	3 4714 1	CAP	ZERO
08007	REP	3	LAST	436	33,3148	55=656 1	TS	PERFDLAY
0801					33,3147	0 0008 1	EXTEND	
0802	REP	4	LAST	98	33,3150	3 1634 1	DCA	LUNCHAZ1
0803	REP	1			33,3151	53=636 1	DXCH	NEWAZ1
08031					33,3152	0 0006 1	EXTEND	
08032	REP	5	LAST	436	33,3153	3 1634 1	DCA	LUNCHAZ1
08033	REP	1			33,3154	53=640 0	DXCH	OLDAZWH
0804	REP	2	LAST	416	33,3155	3 4375 1	CA	DEC17
0805	REP	5	LAST	427	33,3158	55=655 1	TS	ZERONDX1
0806	REP	1			33,3157	3 2446 0	CA	XSMADR
0807	REP	3	LAST	427	33,3160	0 2356 0	TC	ZERONING
0808	REP	1			33,3181	0 3163 0	TC	POSN17C
0809	REP	1			33,3182	0 2030 0	TC	GEOMUTT
0810					33,3183	0 0006 1	EXTEND	
0811	REP	13	LAST	424	33,3164	23=425 0	QXCH	OPLACE
0812	REP	2	LAST	417	33,3165	4 4675 0	CS	HALF
0813	REP	2	LAST	93	33,3166	55=705 0	TS	ZSM
0814	REP	25	LAST	434	33,3167	0 6006 1	TC	INTPRET
0815					33,3170	41545 0	DLOAD	PUSH
0816	REP	2	LAST	436	33,3171	02636 0		NEWAZ1
0817					33,3172	77756 0	SIN	
0818	REP	25	LAST	434	33,3173	02676 1	STORE	XSM +4
0819	REP	2	LAST	93	33,3174	16702 0	STODL	YSM +2
0820					33,3175	77746 1	COS	
0821	REP	3	LAST	436	33,3176	02704 0	STORE	YSM +4
0822					33,3177	77676 0	DCOMP	
0823	REP	26	LAST	436	33,3200	02674 0	STORE	XSM +2
0824					33,3201	77776 1	EXIT	
0825	REP	14	LAST	436	33,3202	0 1425 0	TC	OPLACE
0826	JOB	DONE EVERY ITERATION THROUGH COMPASS PROGRAM SET BY TASK ALL LOOP						
08268	REP	2	LAST	427 TO	432' 142 142*	COUNT	33/P02	
0827					33,3203	44743 1	ALWAYS	DSJ*
0828	REP	3	LAST	432	33,3204	02543 1	DLOAD*	DSJ*
0829	REP	2	LAST	98	33,3205	02505 0		DPIPAY +8D,1 FILDELV1 +8D,1

COMPASS IS A .5 SEC LOOP

GO TO IMU2 FOR FURTHER INITIALIZATION
COMPASS POSITION Z DOWN,X DOWNRANGE
FROM NORTH IN REVOLUTIONS + CLOCKWISE
ALL THIS TO INITIALIZE MATRIX

COMPASS AND ERECT



L IMU CALIBRATION AND ALIGNMENT

USER'S PAGE NO. 22 E5 93

0830 33,3206 42675 0
0831 REF 1 33,3207 27713 1
0832 REF 3 LAST 436 33,3210 02505 0
0833 REF 4 LAST 437 33,3211 06505 1
0834 33,3212 77813 0
0835 REF 1 33,3213 02507 1
0836 REF 2 LAST 437 33,3214 08507 0
0837 33,3215 42675 0
0838 REF 1 33,3216 27715 1
0839 REF 5 LAST 437 33,3217 02505 0
0840 33,3220 41475 1
0841 REF 1 33,3221 15330 0
0842 33,3222 67300 0
0843 REF 2 LAST 431 33,3223 67203 1
0844 REF 1 33,3224 02847 0
0845 33,3225 71254 1
0846 REF 1 33,3228 67237 0
0847 REF 2 LAST 98 33,3227 02471 1
0848 33,3230 45425 0
0849 REF 3 LAST 437 33,3231 61308 0
0850 33,3232 77621 1
0851 REF 4 LAST 437 33,3233 02473 0
0852 REF 5 LAST 437 33,3234 02473 0
0853 33,3235 77650 1
0854 REF 1 33,3236 67261 0
0855 33,3237 43345 1
0856 REF 6 LAST 437 33,3240 02467 0
0857 REF 6 LAST 437 33,3241 02475 0
0858 REF 7 LAST 437 33,3242 16467 0
0859 REF 7 LAST 437 33,3243 02475 0
0860 33,3244 44275 1
0861 REF 1 33,3245 27717 0
0862 REF 6 LAST 437 33,3246 02473 0
0863 REF 9 LAST 437 33,3247 16473 0
0864 REF 6 LAST 437 33,3250 02501 1
0865 33,3251 44275 1
0866 REF 2 LAST 437 33,3252 27717 0
0867 REF 10 LAST 437 33,3253 02471 1
0868 33,3254 57325 1
0869 REF 3 LAST 437 33,3255 02503 0
0870 REF 1 33,3256 27721 0
0871 33,3257 45421 1
0872 REF 12 LAST 437 33,3260 75308 0
0873 33,3261 77776 1
0874 REF 12 LAST 436 33,3262 11*412 0
0875 REF 3 LAST 434 33,3263 0 2522 0
0876 REF 3 LAST 431 33,3264 0 3401 1
0877 REF 2 LAST 188 33,3265 11*304 0

DMPR DAD*
GEOCONS1
FILDELV1 +8D,1
STORE FILDELV1 +8D,1
DAD*
INTVEC1 +8D,1
STORE INTVEC1 +8D,1
DMPR DAD*
GEOCONS2
FILDELV1 +8D,1
DMPR PUSH
GEOCONS5
TIX,1 SLOAD
ALWAYS
ERECTIM1
BZE DLOAD
COMPGS
THETAN1 +2
DSU STADR
STOOL THETAN1 +2 ERECTION ONLY.
BDSU
THETAN1 +4
STORE THETAN1 +4
GOTO
ADDINDRF
DLOAD DAD COMPASS
THETAN1
FILDELV1
STOOL THETAN1
FILDELV1
DMPR BDSU
GEOCONS3
THETAN1 +4
STOOL THETAN1 +4
FILDELV1 +4
DMPR BDSU
GEOCONS3
THETAN1 +2
PDDL DMPR
INTVEC1 +4
GEOCONS4
BDSU STADR
STORE THETAN1 +2
ADDINDRF EXIT
ENDGTSAL CCS LENGTHOT
TC SLEEP IE
TC CHKCOMED
CCS LGYRO
IS 5 SEC OVER-THE TIME TO TORO PLATFORM
NO-SET UP NEXT WAITLIST CALL FOR .5 SEC
YES BUT ARE GYROS BUSY



L IMU CALIBRATION AND ALIGNMENT

USBR-S PAGE NO. 23 E5 S3

0878	REF	4	LAST	437	33,3288	1 2523 0	TOP	SLEEP1E +1	BUSY-GET THEM .5 SECONDS FROM NOW
0879	REF	28	LAST	438	33,3287	0 8008 1	LASTOTS	TC	INTPRET
0880					33,3270	77775 1		VLOAD	
0881	REF	9	LAST	423	33,3271	02850 0			ERCOMP1
0882	REF	4	LAST	430	33,3272	18481 0		STOOL	THETAX1
0883	REF	4	LAST	423	33,3273	02443 0			TMARK
0884	REF	8	LAST	433	33,3274	02457 0		STORE	ALK
0885					33,3275	77778 1		EXIT	
PREVIOUS SECTION WAS FOR RESTARTS									
0888	REF	12	LAST	435	33,3278	0 5301 0	RESTAIER	TC	PHASCHNG
0887					33,3277	00275 1		OCT	00275
0888	REF	27	LAST	438	33,3300	0 8008 1		TC	INTPRET
0889					33,3301	84375 1		VLOAD	MXV
0890	REF	12	LAST	437	33,3302	02487 0			THETAN1
0891	REF	27	LAST	438	33,3303	02872 0			XSM
0892					33,3304	53372 1		VSL1	VAD
0893	REF	5	LAST	438	33,3305	02461 0			THETAX1
0894	REF	10	LAST	438	33,3308	18850 0		STOOL	ERCOMP1
0895	REF	9	LAST	438	33,3307	02457 0			ALK
0898	REF	5	LAST	438	33,3310	02443 0		STORE	TMARK
0897					33,3311	77778 1		EXIT	
0898	REF	5	LAST	429	33,3312	0 2417 1		TC	EARTHRA
0899	REF	2	LAST	437	33,3313	31-848 1		CAE	ERECTIM1
0900	REF	4	LAST	430	33,3314	55-831 0		TS	GEOSAVE1
0901	REF	13	LAST	438	33,3315	0 5301 0		TC	PHASCHNG
0902					33,3318	00155 0		OCT	00155
0903	REF	28	LAST	438	33,3317	0 8008 1	RETEST1	TC	INTPRET
0904					33,3320	77775 1		VLOAD	
0905	REF	5	LAST	427	33,3321	27112 0			SCHZEROS
0908	REF	13	LAST	438	33,3322	02487 0		STORE	THETAN1
0907					33,3323	77778 1		EXIT	
0912	REF	1			33,3324	11-832 0		CCS	PREMTRXC
09121	REF	1			33,3325	0 3374 1		TC	NOCHORD
09122	REF	14	LAST	438	33,3328	0 5301 0		TC	PHASCHNG
0913					33,3327	00255 0		OCT	00255
09131	REF	29	LAST	438	33,3330	0 6008 1	RETEST3	TC	INTPRET
0914					33,3331	77745 1		DLOAD	
09142	REF	2	LAST	189	33,3332	02634 1			LAUNCHAZ
0915					33,3333	53025 0		DSJ	RZE
09151	REF	2	LAST	438	33,3334	02840 1			OLDAZMTH
09152	REF	1			33,3335	87371 0			NOAZCHGE
09153					33,3338	00001 0		STORE	0D
09154					33,3337	43335 0		SLOAD	DAD
09155	REF	2	LAST	421	33,3340	27120 1			QNEPP +1
0918	REF	2	LAST	438	33,3341	02833 0			PREMTRXC
0919	REF	3	LAST	438	33,3342	16833 0		STOOL	PREMTRXC
0920	REF	3	LAST	438	33,3343	02634 1			LAUNCHAZ
09201	REF	1			33,3344	18638 0		STOOL	NEWAZMTH
09202					33,3345	00001 0			0D

DOES NOT CHANGE LAUNCHAZ



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09203	REF	1		33,3346	02854 1	ADDERCOMP	STORE	ERCOMP +4	
09204				33,3347	77776 1		EXIT		
09205	REF	2	LAST	438	33,3350	0 3163 0	TC	POSN17C	
09206	REF	15	LAST	438	33,3351	0 5301 0	TC	PHASCHNG	
09207				33,3352	00335 1		OCT	00335	
0921				33,3353	0 0006 1	RESCNG	EXTEND		
0922	REF	2	LAST	438	33,3354	3 1838 0	DCA	NEWAZMTH	
0923	REF	3	LAST	438	33,3355	53=840 0	DXCH	OLDAZMTH	
09231	REF	33	LAST	384	33,3356	3 4704 0	CA	BIT7	
09232	REF	13	LAST	437	33,3357	55=412 0	TS	LENGHOT	SPEND 320 SEC. ERECTING
0924	REF	18	LAST	439	33,3360	0 5301 0	TC	PHASCHNG	
0925				33,3361	00075 0		OCT	00075	
0926	REF	1			33,3362	3 3423 1	SPITGYRO	CA	ERCOMPPL
0927	REF	70	LAST	434	33,3363	0 4555 0	TC	BANKCALL	
0928	REF	4	LAST	434	33,3364	17125 1	CADR	IMPULSE	
0929	REF	71	LAST	439	33,3365	0 4555 0	TC	BANKCALL	
0930	REF	7	LAST	421	33,3366	17518 0	CADR	IMUSTALL	
0931	REF	2	LAST	421	33,3367	0 3103 0	TC	SOMERR2	
09311	REF	3	LAST	420	33,3370	0 2453 1	TC	ESTIMS	RE-INITIALIZE
0932				33,3371	77778 1	NOAZCHGE	EXIT		
0933	REF	58	LAST	438	33,3372	3 4712 1	CA	ONE	
0934	REF	4	LAST	438	33,3373	55=632 0	TS	PREMTRC	
0941	REF	5	LAST	438	33,3374	11=831 0	NOCHORLD	CCS	GEOSAVE1
0942	REF	3	LAST	438	33,3375	55=646 0	TS	ERECTIM1	COUNTS DOWN FOR ERECTION.
0943	REF	1			33,3376	3 4334 1	ANNNNNN	CAP	NINE
0944	REF	14	LAST	439	33,3377	55=412 0	TS	LENGHOT	
0945	REF	5	LAST	438	33,3400	0 2523 1	TC	SLEEP1E +1	
0946				33,3401	0 0004 0	CHKCOMED	INHINT		
0947	REF	101	LAST	438	33,3402	4 4714 0	CS	ZERO	
0948				33,3403	0 0006 1		EXTEND		
0949	REF	5	LAST	244	33,3404	06 030 1	RXOR	CHAN30	READ AND INVERT BITS IN CHANNEL 30
0950	REF	24	LAST	419	33,3405	7 4706 0	MASK	BITS	LIFTOFF BIT
0951	REF	133	LAST	430	33,3406	10 000 0	CCS	A	
0952	REF	1			33,3407	1 3416 0	TCF	PRELTERM	LIFTOFF HAS OCCURRED
0953	REF	25	LAST	439	33,3410	3 4708 1	CA	BITS	CHECK FOR BACKUP LIFTOFF
0954	REF	8	LAST	383	33,3411	7 0101 0	MASK	FLAGWRD5	BITS FLAGWRD5
0955	REF	134	LAST	439	33,3412	10 000 0	CCS	A	
0956	REF	2	LAST	439	33,3413	1 3416 0	TCF	PRELTERM	BACKUP RECEIVED
0957				33,3414	0 0003 1		RELINT		
0958	REF	150	LAST	430	33,3415	0 0002 0	TC	O	CONTINUE PRELAUNCH
0959	REF	1			33,3416	3 7857 1	PRELTERM	CA	PRIO22

PRELAUNCH DONE - SET UP P11



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0980	REF	4	LAST	385	33,3417	0 5103 0	TC	PRIORNG	INCREASE PRIORITY HIGHER THAN SERVICER
0981					33,3420	0 0004 0	INHINT		
0982	REF	34	LAST	380	33,3421	0 4574 0	TC	POSTJUMP	
0983	REF	1			33,3422	70002 1	CADR	P11	
0985	REF	2	LAST	439	33,3423	02847 0	ERCOMPPL	ECADR	ERCOMP
0988	REF	3	LAST	389	28,3327		GEOCONSS	EQUALS	HIDPHALF
0989					33,3424	08200 0	1/PIPAGT	OCT	08200
0970	REF	6	LAST	424	4375		17DEOML	=	ND1
0971	REF	16	LAST	424	4374		19DEOML	=	VD1
0972	REF	3	LAST	184	4731		1/2SEOX	=	.5SEC

OCT 21
OCT 23



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09725 REF 56 LAST 429

5112

GEOSTRT4 EQUALS ENDOPJOB



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P0973 OPTICAL VERIFICATION ROUTINES FOR GYROCOMPASS

09735 REP 1. COUNT 33/P03

0974 REP 17 LAST 439 33,3425 0 5301 0 GCOMPVER TC PHASCHNG OPTICAL VERIFICATION ROUTINE
0975 33,3426 00154 1 OCT 00154
0976 REP 4 LAST 427 33,3427 0 5243 1 TC NEWMODEX ENTERED BY VERB 65 ENTER
0977 33,3430 00003 1 MM 03
09771 REP 1 33,3431 0 2037 1 SETNBPOS TC NBPOSPL
0978 REP 72 LAST 439 33,3432 0 4555 0 TC BANKCALL
0979 REP 2 LAST 420 33,3433 16063 0 CADR MCRELEAS
0980 REP 34 LAST 379 33,3434 3 4712 1 OPTDATA CAP BIT1 CALLS FOR AZIMUTH AND ELEVATION OF TARGET
0981 33,3435 22 007 0 ZL T 1, THEN TARGET 2
0982 REP 1 33,3436 23=427 1 LXCH RUN AZIMUTH CLOCKWISE FROM NORTH TO TARGET
0983 REP 20 LAST 360 33,3437 55=047 1 TS DSPTM1 +2 ELEVATION MEASURED FROM HORIZONTAL
0984 33,3440 0 0006 1 EXTEND
0985 REP 2 LAST 442 33,3441 5 1427 1 INDEX RUN
0986 REP 1 33,3442 3 1433 1 DCA TAZEL1
0987 REP 21 LAST 442 33,3443 53=046 0 DXCH DSPTM1
0988 REP 1 33,3444 3 3487 1 CAP V05N30E
0989 REP 73 LAST 442 33,3445 0 4555 0 TC BANKCALL
0990 REP 1 33,3446 20577 0 CADR GODSPRET
0991 REP 1 33,3447 3 3455 0 CAP VN0641
09911 REP 74 LAST 442 33,3450 0 4555 0 TC BANKCALL
09912 REP 4 LAST 424 33,3451 20624 0 CADR GOFASH
09913 REP 1 33,3452 0 3610 0 TC GCOMP5
09914 33,3453 0 3456 0 TC +3
09915 33,3454 0 3444 0 TC -8D
09916 33,3455 01451 0 VN0641 VN 0641
0992 REP 22 LAST 442 33,3456 53=046 0 DXCH DSPTM1 TAZEL1 TARGET 1 AZIMUTH
0993 REP 3 LAST 442 33,3457 51=427 1 INDEX RUN
0994 REP 2 LAST 442 33,3460 53=433 0 DXCH TAZEL1 TAZEL1 +2 TARGET 2 AZIMUTH
0995 REP 4 LAST 442 33,3461 11=427 0 CCS RUN
0996 33,3462 1 3466 1 TCF +4
0997 REP 26 LAST 416 33,3463 3 4711 1 CAP TWO
0998 REP 55 LAST 424 33,3464 54 001 1 TS L
0999 REP 1 33,3465 1 3436 1 TCF OPTDATA +2 MPAC 1ST PASS=0 2ND PASS=2
09991 REP 1 33,3466 0 3530 1 TC CONTIN33

099921 33,3467 01236 1 V05N30E VN 0530

10136 REP 30 LAST 436 33,3470 0 6006 1 TC INTERPRET
1014 33,3471 77170 1 TAR/EREP AXT,1 AXT,2
1015 33,3472 00002 0 2
1016 33,3473 00014 1 12D
1017 33,3474 40331 1 SSP SETPD
1018 REP 3 LAST 423 33,3475 00052 0 S2
1019 33,3476 00006 1 6

UNDYNAMIC ASSEMBLER
TARGET VECTOR
 $\sin(EL) = \cos(AZ)\cos(EL) \quad \sin(AZ)\cos(EL)$

L IMU CALIBRATION AND ALIGNMENT

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1020			33,3477	00001 0		0		
1021			33,3500	60533 1	TAR1	SLOAD* SR2		X1=2 X2=12 S2=6 X1=0 X2=6 S2=6
1022	REF	3	LAST	442		TAZEL1 +3,1		
1023			33,3502	00001 0		STORE 0		PD00 ELEVATION PD00
1024			33,3503	77756 0		SIN		
1025			33,3504	10023 1		STORE 18D,2		PD06 *** SIN(EL) ***PD12
1026			33,3505	77745 1		DLOAD		
1027			33,3506	00001 0		0		
1028			33,3507	41546 0		COS PUSH		PD00 COS(EL) PD00
1029			33,3510	47133 0		SLOAD* RTB		
1030	REF	4	LAST	443		TAZEL1 +2,1		
1031	REF	4	LAST	396		CDULOGIC		
1032			33,3513	00003 1		STORE 2		PD02 AZIMUTH PD02
1033			33,3514	41356 1		SIN DMP		
1034			33,3515	00001 0		0		
1035			33,3516	77752 1		SL1		
1036			33,3517	10027 0		STORE 22D,2		PD10 *** SIN(AZ)COS(EL) ***PD16
1037			33,3520	71545 0		DLOAD COS		
1038			33,3521	00003 1		2		
1039			33,3522	72405 0		DMP SL1		
1040			33,3523	76076 1		DCOMP AXI,1		
1041			33,3524	00000 1		0		
1042			33,3525	10025 1		STORE 20D,2		PD08 *** -COS(AZ)COS(EL) ***PD14
1043			33,3526	43504 1		TI,2		
1044	REF	1		33,3527	67500 0	TAR1		
10443				33,3530		BANK 33		
104435	REF	4	LAST	427		SETLOC IMUCAL		
10444				33,3530		BANK		
104445	REF	1				COUNT* \$\$/PO3		
10445	REF	59	LAST	439	33,3530	3 4712 1	CONTIN33 CA ONE	
10446	REF	3	LAST	276	33,3531	54 735 1	TS STARCODE	
10447	REF	102	LAST	439	33,3532	3 4714 1	CA ZERO	
10448	REF	1			33,3533	0 3625 0	TC TARGETIVE	
10449	REF	31	LAST	442	33,3534	0 6006 1	TC INTPRET	
104492					33,3535	77624 1	CALL	
104494	REF	1			33,3536	67471 1	TAR/EREF	
104496					33,3537	64375 1	NEXTBANKS VLOAD MXV	
1045					33,3540	00007 0	6D	
1047	REF	26	LAST	438	33,3541	02672 0	XS4	
10471					33,3542	77772 0	VSL1	
1048	REF	3	LAST	93	33,3543	26736 1	STOVL STARAD	
1049					33,3544	00015 0	12D	
1050					33,3545	76521 0	MXV VSL1	
1051	REF	29	LAST	443	33,3546	02672 0	XS4	
1052	REF	4	LAST	443	33,3547	02744 1	STORE STARAD +6	
1053					33,3550	77624 1	CALL	
1054	REF	1			33,3551	67722 1	LITLSUB	



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1060	REF	4	LAST	434	33,3552	02414 1	STORE	LOSVEC
1061					33,3553	77778 1	EXIT	
1062	REF	75	LAST	442	33,3554	0 4555 0	TC	BANKCALL
1063	REF	3	LAST	442	33,3555	18063 0	CADR	KRELEAS
1069	REF	27	LAST	442	33,3556	3 4711 1	NEXBNKSS	CAF
1070	REF	4	LAST	443	33,3557	54 735 1	TS	STARCODE
1071	REF	16	LAST	409	33,3560	3 6211 0	CAF	SIX
1072	REF	2	LAST	443	33,3561	0 3625 0	TC	TARGDRVE
1073	REF	32	LAST	443	33,3562	0 6006 1	TC	INTPRET
1074					33,3563	77624 1	CALL	
1075	REF	2	LAST	443	33,3584	87722 1		LITLSUB
10751					33,3565	24015 0	STOVL	12D
10752	REF	5	LAST	444	33,3566	02414 1		LOSVEC
10753					33,3567	34007 1	STCALL	06D
10754	REF	1			33,3570	47334 0		AXISEN
10755					33,3571	77624 1	CALL	
10756	REF	1			33,3572	47140 1		CALGTA
10757					33,3573	77778 1	EXIT	
1076	REF	1			33,3574	3 3621 1	GCMP4	CAF
1077	REF	76	LAST	444	33,3575	0 4555 0	TC	V06N93S
1078	REF	5	LAST	442	33,3576	20624 0	CADR	BANKCALL
1079	REF	2	LAST	442	33,3577	0 3810 0	TC	GOFLASH
1080					33,3600	1 3602 1	TCF	GCMP5
1061	REF	1			33,3601	1 3574 0	TCF	+2
1062	REF	33	LAST	444	33,3602	0 6008 1	TC	GCMP4
1063					33,3603	53375 0	TC	INTPRET
1084	REF	11	LAST	434	33,3604	02780 1	VLOAD	VAD
1085	REF	11	LAST	438	33,3605	02850 0		OGC
1086	REF	12	LAST	444	33,3608	02650 0	STORE	ENCOMP1
1087					33,3607	77778 1	EXIT	ENCOMP1
1088	REF	77	LAST	444	33,3810	0 4555 0	GCMP5	TC
1089	REF	4	LAST	444	33,3611	18063 0	TC	BANKCALL
10695	REF	22	LAST	420	33,3612	0 5447 0	CADR	KRELEAS
10898	REF	2	LAST	228	33,3613	00032 0	TC	DOWNFLAG
							ADRES	TR403PLG
1090	REF	5	LAST	442	33,3614	0 5243 1	TC	NEXMODEX
1091					33,3615	00002 0	MM	02
1092	REF	18	LAST	442	33,3616	0 5301 0	TC	PHASCHNG
1093					33,3617	00004 0	OCT	00004
1094	REF	57	LAST	441	33,3620	0 5112 0	TC	ENDOFJOB
1097					33,3621	01535 0	V06N93S	VN
1096	REF	23	LAST	435	33,3622	0 5537 0	GTSOPTCS	0693
1099					33,3623	01602 1	TC	ALARM
1100	REF	3	LAST	444	33,3624	0 3610 0	OCT	01602
11001					34,2002		TC	GCMP5
11002	REF	1			04,2000		BANK	34
							SETLOC	IMUCAL1



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11003				04,2617		BANK	
110035	REF	1				COUNT	34/COMST
1119				04,2617	62545 1	LATAZCHK	DLOAD SL2
1120	REF	4	LAST	423	04,2620		LATITUDE
1121	REF	23	LAST	442	04,2621		DSPTM1 +1
1122	REF	3	LAST	417	04,2622	STOOL	AZIMUTH
1123					04,2623	RTB	EXIT
1124	REF	3	LAST	263	04,2624		1STO2S
1125	REF	233	LAST	433	04,2625	XCH	MPAC
1126	REF	24	LAST	445	04,2626	TS	DSPTM1
1127	REF	76	LAST	444	04,2627	TC	BANKCALL
1128	REF	1			04,2630	CADR	CLEANDSP
1129	REF	1			04,2631	CAP	VNG0641
11291	REF	79	LAST	445	04,2632	TC	BANKCALL
11292	REF	6	LAST	444	04,2633	CADR	GOFLASH
11293					04,2634	TC	+2
11294					04,2635	TC	+2
11295					04,2636	TC	-5
1130	REF	34	LAST	444	04,2637	TC	INTPRET
1131					04,2640	SLOAD	RTB
1132	REF	25	LAST	445	04,2641		DSPTM1
1133	REF	5	LAST	443	04,2642		CDUOLOC
1134	REF	4	LAST	445	04,2643	STORE	AZIMUTH
11341					04,2644	SLOAD	SR2
11342	REF	26	LAST	445	04,2645		DSPTM1 +1
11343	REF	5	LAST	445	04,2646	STORE	LATITUDE
1135					04,2647	RVO	
11351					04,2650	VNG0641	VN 0641
1136					33,3625	BANK	33
1137	REF	5	LAST	443	33,2000	SETLOC	IMUCAL
1138					33,3625	BANK	
1139	REF	2	LAST	442 TO 443	67 67*	COUNT*	55/P03
1140					33,3625	TARGORVE	EXTEND
1141	REF	1			33,3626	QXCH	OPLAC
1142	REF	1			33,3627	TS	TARG1/2
11421	REF	35	LAST	445	33,3630	TC	INTPRET
1143					33,3631	CALL	
1144	REF	2	LAST	443	33,3632		TAR/REF
1145					33,3633	LXC,1	VLOAD*
1146	REF	2	LAST	445	33,3634		TARG1/2
1147					33,3635		6D,1
1148	REF	10	LAST	283	33,3636	STCALL	STAR
1149	REF	1			33,3637		SXTANG
1150					33,3640	EXIT	

CALLS FOR AZIMUTH AND LATITUDE

NOT ALLOWED



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1151	REF	6	LAST	263	33,3641	3 1773 0	CA	SAC
1152	REF	4	LAST	236	33,3642	55*161 1	TS	DESOPTS
1153	REF	6	LAST	263	33,3643	3 1775 0	CA	PAC
1154	REF	5	LAST	236	33,3644	55*160 0	TS	DESOPTT
1155	REF	103	LAST	443	33,3645	3 4714 1	RETARG	CAP ZERO
1156	REF	22	LAST	385	33,3646	55*303 1	TS	OPTIND
1157	REF	60	LAST	443	33,3647	3 4712 1	CAP	ONE
1158	REF	60	LAST	445	33,3650	0 4555 0	TC	BANKCALL
1159	REF	1			33,3651	16002 1	CADR	SXTMARK
1160	REF	81	LAST	446	33,3652	0 4555 0	TC	BANKCALL
1161	REF	1			33,3653	17512 1	CADR	OPTSTALL
1162	REF	1			33,3654	0 3622 1	TC	GTSOPTCS
116201	REF	11	LAST	364	33,3655	30 075 0	CAB	FLAGTRD1
116202	REF	1			33,3656	7 4707 1	MASK	TRM03BIT
116203	REF	135	LAST	439	33,3657	10 000 0	CCS	A
116204	REF	4	LAST	444	33,3660	0 3610 0	TC	GCMP5
11621	REF	26	LAST	261	33,3661	51*330 0	INDEX	MARKSTAT
11622	REF	6	LAST	259	33,3662	3 0052 0	CA	OPRET
11623					33,3663	0 0008 1	EXTEND	
11624	REF	1			33,3664	1 3666 0	BZF	RETARG1
1163	REF	2	LAST	445	33,3665	0 1424 1	TC	OPLAC
1164	REF	104	LAST	446	33,3666	3 4714 1	RETARG1	CA ZERO
1165	REF	27	LAST	446	33,3667	57*330 0	XCH	MARKSTAT
1166	REF	136	LAST	446	33,3670	10 000 0	CCS	A
1167	REF	137	LAST	446	33,3671	50 000 1	INDEX	A
1168	REF	136	LAST	446	33,3672	54 000 0	TS	A
1169	REF	1			33,3673	1 3645 1	TCP	RETARG
1170					33,3674		BANK	33
1171	REF	6	LAST	445	33,2000		SETLOC	IMUCAL
1172					33,3674		BANK	
1173	REF	3	LAST	445 TO 446	39 106*		COUNT*	SS/P03
1200					33,3674	30341 1	2DEC	.76376833
1200					33,3675	22444 0		
1201					33,3676	57223 0	VELSC	2DEC -.52223476
1201					33,3677	66451 1		
1202					33,3700	05427 0	ALSK	2DEC .17329931
1202					33,3701	12577 1		
1203					33,3702	77567 0		2DEC -.00635370
1203					33,3703	44202 1		
1204					33,3704	24276 1	GEORGEJ	2DEC .63661977
1204					33,3705	14066 1		
1205					33,3706	23073 1	GEORGEK	2DEC .59737013
1205					33,3707	11773 1		
1206					33,3710	00055 1	2DEGRES	2DEC .00277778
1206					33,3711	20267 0		
1207					33,3712	03146 1	GECONS1	2DEC .1
1207					33,3713	14632 0		

RELEASE PREVIOUSLY GRABBED VAC AREA

GO DO SXTMARK AGAIN



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1208				33,3714	00121 0	GEOCONS2 2DEC	.005	
1208				33,3715	35341 1			
1209				33,3716	01767 0	GEOCONS3 2DEC	.062	
1209				33,3717	31666 0			
1210				33,3720	00004 0	GEOCONS4 2DEC	.0003	
1210				33,3721	35223 1			
12525	REF	3	LAST	436 TO 442	146 266*	COUNT	33/P02	
1253				33,3722	77620 0	LITLSUB	STO	
1254	REF	3	LAST	446	33,3723	02424 1		
1255				33,3724	76740 0	LXC,1	OPLAC	
1256	REF	26	LAST	446	33,3725	01330 0	VLOAD*	
1257				33,3726	00003 1		MARKSTAT	
1258	REF	4	LAST	73	33,3727	34767 0	2,1	
1259	REF	1			33,3730	46000 0	STCALL CDUSPOT	
1260				33,3731	77624 1		SXINB	
1261	REF	1			33,3732	47572 1	CALL	
1262				33,3733	77650 1		TRGNBSM	
1263	REF	4	LAST	447	33,3734	02424 1	GOTO	
1265				33,3735	77776 1		OPLAC	
1300	REF	36	LAST	445	33,3736	0 6006 1	EXIT	
1301				33,3737	47145 1	AZMHCG1 TC	INTPRET	
1302	REF	3	LAST	439	33,3740	02636 0	DLOAD	RTB
1303	REF	4	LAST	445	33,3741	45543 1		NEWAZMTH
1304				33,3742	77776 1			1STO2S
1305	REF	234	LAST	445	33,3743	56 154 1	EXIT	
1306	REF	27	LAST	445	33,3744	55=045 0	XCH	MPAC
1307	REF	62	LAST	446	33,3745	0 4555 0	TS	DSPTM1
1308	REF	2	LAST	445	33,3746	20607 1	TC	BANKCALL
1309	REF	1			33,3747	3 3771 0	CADR	CLEANDSP
1310	REF	63	LAST	447	33,3750	0 4555 0	CAP	VN0629
1311	REF	7	LAST	445	33,3751	20624 0	TC	BANKCALL
1312				33,3752	1 3754 0		CADR	GOF LASH
1313				33,3753	1 3755 1		TCF	+2
1314				33,3754	1 3747 1		TCF	+2
1315	REF	37	LAST	447	33,3755	0 6006 1	TCF	-5
1316				33,3756	47135 0		TC	INTPRET
1317	REF	26	LAST	447	33,3757	01046 1	SLOAD	RTB
1318	REF	6	LAST	445	33,3760	45510 1		DSPTM1
1319	REF	4	LAST	436	33,3761	02634 1		CDULOGIC
1320				33,3762	77776 1		STORE	LAUNCHAZ
1321	REF	105	LAST	446	33,3763	3 4714 1	EXIT	
1322	REF	5	LAST	439	33,3764	55=632 0	CA	ZERO
1323	REF	19	LAST	444	33,3765	0 5301 0	TS	PREMTRXC
1324				33,3766	00004 0		TC	PHASCHNG
1325	REF	35	LAST	440	33,3767	0 4574 0	OCT	00004
13255	REF	5	LAST	362	33,3770	21176 1	TC	POSTJUMP
							CADR	PINBRNCH
1326				33,3771	01435 1	VN0629	VN	0629



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L IMU CALIBRATION AND ALIGNMENT

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*** END OF KOOLADE .069 ***



L GROUND TRACKING DETERMINATION PROGRAM - P21

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P0001 GROUND TRACKING DETERMINATION PROGRAM P21
R0002 PROGRAM DESCRIPTION
R0003 MOD NO - 1
R0004 MOD BY - N.M. NEVILLE
R0005 FUNCTIONAL DESCRIPTION -
R0006
R0007 TO PROVIDE THE ASTRONAUT DETAILS OF THE LM OR CSM GROUND TRACK WITHOUT
R0008 THE NEED FOR GROUND COMMUNICATION (REQUESTED BY DSKY).
R0009 CALLING SEQUENCE -
R0010
R0011 ASTRONAUT REQUEST THROUGH DSKY V37E21B
R0012 SUBROUTINES CALLED -
R0013
R0014 OOPERF4
R0015 OOFASH
R0016 THISPREC
R0017 OTHPREC
R0018 LAT-LONG
R0019 NORMAL EXIT MODES -
R0020
R0021 ASTRONAUT REQUEST THROUGH DSKY TO TERMINATE PROGRAM V34B
R0022 ALARM OR ABORT EXIT MODES -
R0023
R0024 NONE
R0025 OUTPUT -
R0026
R0027 OCTAL DISPLAY OF OPTION CODE AND VEHICLE WHOSE GROUND TRACK IS TO BE
R0028 COMPUTED
R0029 OPTION CODE 00002
R0030 THIS 00001
R0031 OTHER 00002
R0032 DECIMAL DISPLAY OF TIME TO BE INTEGRATED TO HOURS , MINUTES , SECONDS
R0033 DECIMAL DISPLAY OF LAT, LONG, ALT
R0034 ERASABLE INITIALIZATION REQUIRED
R0035
R0036
R0037
R0038 AXO 2DEC 4.852459853 E-5 RADIANS Σ68-69 CONSTANTS
R0039
R0040 -AYO 2DEC 2.147535898 E-5 RADIANS
R0041
R0042 AZO 2DEC .7753206184 REVOLUTIONS
R0043 FOR LUNAR ORBITS 504LM VECTOR IS NEEDED
R0044
R0045 504LM 2DEC -2.700340600 E-5 RADIANS
R0046
R0047 504LM 2 2DEC -7.514128400 E-4 RADIANS
R0048
R0049 504LM 4 2DEC 2.553198641 E-4 RADIANS
R0050
R0051 NONE
R0052 DEBRIS



L GROUND TRACKING DETERMINATION PROGRAM - P21

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R0051
R0052 CENTRALS-A,Q,L
R0053 OTHER-THOSE USED BY THE ABOVE LISTED SUBROUTINES
R0054 SEE LEMPREC, LAT-LONG
0055 REF 3 LAST 279 30,2000 SBANK= LOWSUPER FOR LOW 2CADRαS.
0056 33,3772
0057 REF 1 37,2000 BANK 33
0058 37,2001 SETLOC P20S
BANK
0059 REF 3 LAST 256 E4,1715 EBANK= P21TIME
0060 REF 1 COUNT 24/P21
0061 REF 61 LAST 446 37,2001 3 4712 1 PROG21 CAP ONE
0062 REF 2 LAST 276 37,2002 55=132 1 TS OPTION2
0063 REF 21 LAST 369 37,2003 3 4711 1 CAP BIT2 ASSUMED VEHICLE IS LM', R2 = 00001
0064 REF 84 LAST 447 37,2004 0 4555 0 TC BANKCALL OPTION 2
0065 REF 1 37,2005 20761 0 CADR GOPERF4
0066 REF 3 LAST 385 37,2006 0 4106 1 TC GOTOPOCH
0067 37,2007 0 2011 0 TC +2
0068 37,2010 0 2003 0 TC -5
0069 REF 1 37,2011 3 2102 0 P21PROG1 CAP V6N34
0070 REF 85 LAST 450 37,2012 0 4555 0 TC BANKCALL
0071 REF 6 LAST 447 37,2013 20624 0 CADR GOFFLASH
0072 REF 4 LAST 450 37,2014 0 4106 1 TC GOTOPOCH
0073 37,2015 0 2017 0 TC +2
0074 37,2016 0 2011 0 TC -5
0075 REF 38 LAST 447 37,2017 0 6006 1 TC INTERPT
0076 37,2020 77745 1 DLOAD
0077 REF 29 LAST 447 37,2021 01046 1 DSPTM1
0078 REF 4 LAST 450 37,2022 02316 1 STORE P21TIME
0079 37,2023 45335 0 SLOAD DSU
0080 REF 3 LAST 450 37,2024 01133 1 OPTION2
0081 REF 1 37,2025 36100 0 P21ONEVN
0082 37,2026 71230 0 DLOAD
0083 REF 1 37,2027 76042 0 BHIZ
0084 REF 5 LAST 450 37,2030 02316 1 P21PROG2
0085 REF 2 LAST 204 37,2031 34041 0 P21TIME
0086 REF 1 37,2032 27036 1 STCALL TDEC1
0087 37,2033 46135 1 P21PROG4 SLOAD OHPREC
0088 REF 1 37,2034 00050 1 X2
0089 REF 1 37,2035 76050 0 P21PROG3
0090 37,2036 43175 0 VLOAD SETGO
0091 REF 1 37,2037 00001 0 RATT
0092 REF 1 37,2040 01423 0 LUNAFIAG
0093 REF 1 37,2041 76053 0 P21PROG4
0094 37,2042 77745 1 P21PROG2 DLOAD
0095 REF 6 LAST 450 37,2043 02316 1 P21TIME
0096 REF 3 LAST 450 37,2044 34041 0 STCALL TDEC1
0097 REF 1 37,2045 27022 1 THISPREC

TERMINATE
PROCEED VALUE OF ASSUMED VEHICLE OK
R2 LOADED THROUGH DSKY
LOAD DESIRED TIME OF LAT-LONG.

TERM
PROCEED VALUES OK
TIME LOADED THROUGH DSKY

VEHICLE TO BE INTEGRATED IS LEM
VEHICLE TO BE INTEGRATED IS GSM
INTEGRATE TO TIME SPECIFIED IN TDEC
ADJUST UNITS FOR LAT-LONG ROUTINE



L GROUND TRACKING DETERMINATION PROGRAM - P21

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0098			37,2046	77650 1	GOTO		
0099	REF	1	37,2047	76033 0		P21PROG4	
0100			37,2050	43175 0	P21PROG3	VLOAD	CLEAR
0101	REF	2	LAST 450	37,2051	00001 0		RATT
0102	REF	2	LAST 450	37,2052	01863 0		LINAFLAG
0103	REF	2	LAST 87	37,2053	16152 0	P21PROG4	STOOL
0104	REF	1		37,2054	00015 0		ALPHAV
0105			37,2055	45014 0		TAT	
0106	REF	1		37,2056	00662 0	CLEAR	CALL
0107	REF	1		37,2057	26322 0		ERADFLAG
0108			37,2060	77776 1			LAT-LONG
0109	REF	1		37,2061	3 2101 0	EXIT	
0110	REF	86	LAST 450	37,2062	0 4555 0	CAP	V06N43
0111	REF	9	LAST 450	37,2063	20624 0	TC	BANKCALL
0112	REF	5	LAST 450	37,2064	0 4106 1	CADR	GOFASH
0113	REF	6	LAST 451	37,2065	0 4106 1	TC	GOTOPOOH
0114	REF	39	LAST 450	37,2066	0 6006 1	TC	GOTOPOOH
0115			37,2067	43345 1	TC	INTPRET	V32E RECYCLE
0116	REF	7	LAST 450	37,2070	02316 1	DLOAD	DAD
0117	REF	1		37,2071	36076 0		P21TIME
0118	REF	30	LAST 450	37,2072	01046 1		600SEC
0119			37,2073	77634 0	STORE	DSPTM1	600 SECONDS OR 10 MIN
0120	REF	1		37,2074	76011 0	RTR	
0121			37,2075	00003 1	600SEC	2DEC	60000
0121			37,2076	25140 0			10 MIN
0122			37,2077	00001 0	P21ONENN	OCT	00001
0123			37,2100	00000 1		OCT	00000
0124			37,2101	01453 1	V06N43	VN	00643
0125			37,2102	01442 1	V06N34	VN	00634

DISPLAY LAT, LONG, ALT
LAT, LONG = 1/2 REVS B0
ALT = KM B14
TERM

V32E RECYCLE

600 SECONDS OR 10 MIN

NEEDED TO DETERMINE VEHICLE
TO BE INTEGRATED



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P0010 TRANSFER PHASE INITIATION (TPI) PROGRAMS (P34 AND P74)

R0011 MOD NO -1 LOG SECTION - P32-P35, P72-P75

R0012 MOD BY WHITE.P DATE 1JUNE87

R0013 PURPOSE

R0014 (1) TO CALCULATE THE REQUIRED DELTA V AND OTHER INITIAL CONDITIONS
R0015 REQUIRED BY THE ACTIVE VEHICLE FOR EXECUTION OF THE TRANSFER
R0018 PHASE INITIATION (TPI) MANEUVER, GIVEN -

R0017 (A) TIME OF IGNITION TIG (TPI) OR THE ELEVATION ANGLE (E) OF
R0018 THE ACTIVE/PASSIVE VEHICLE LOS AT TIG (TPI).

R0019 (B) CENTRAL ANGLE OF TRANSFER (CENTANG) FROM TIG (TPI) TO
R0020 INTERCEPT TIME (TIG (TPP)).

R0021 (2) TO CALCULATE TIG (TPI) GIVEN E OR E GIVEN TIG (TPI).

R0022 (3) TO CALCULATE THESE PARAMETERS BASED UPON MANEUVER DATA
R0023 APPROVED AND KEYED INTO THE DSKY BY THE ASTRONAUT.

R0024 (4) TO DISPLAY TO THE ASTRONAUT AND THE GROUND CERTAIN DEPENDENT
R0025 VARIABLES ASSOCIATED WITH THE MANEUVER FOR APPROVAL BY THE
R0028 ASTRONAUT/GROUND.

R0027 (5) TO STORE THE TPI TARGET PARAMETERS FOR USE BY THE DESIRED
R0028 THRUSTING PROGRAM.

R0029 ASSUMPTIONS

R0030 (1) LM ONLY - THIS PROGRAM IS BASED UPON PREVIOUS COMPLETION OF
R0031 THE CONSTANT DELTA ALTITUDE (CDH) PROGRAM (P33/P73).
R0032 THEREFORE -

R0033 (A) AT A SELECTED TPI TIME (NOW IN STORAGE) THE LINE OF SIGHT
R0034 BETWEEN THE ACTIVE AND PASSIVE VEHICLES WAS SELECTED TO BE
R0035 A PRESCRIBED ANGLE (E) (NOW IN STORAGE) FROM THE
R0036 HORIZONTAL PLANE DEFINED BY THE ACTIVE VEHICLE POSITION.

R0037 (B) THE TIME BETWEEN CDH IGNITION AND TPI IGNITION WAS
R0038 COMPUTED TO BE GREATER THAN 10 MINUTES.

R0039 (C) THE VARIATION OF THE ALTITUDE DIFFERENCE BETWEEN THE
R0040 ORBITS WAS MINIMIZED.

R0041 (D) THE PERICENTER ALTITUDES OF ORBITS FOLLOWING CSI AND

R0042 CDH WERE COMPUTED TO BE GREATER THAN 35,000 FT FOR LUNAR



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R0043 ORBIT OR 85 NM FOR EARTH ORBIT.

R0044 (E) THE CSI AND CDH MANEUVERS WERE ASSUMED TO BE PARALLEL TO
R0045 THE PLANE OF THE PASSIVE VEHICLE ORBIT. HOWEVER, CREW
R0046 MODIFICATION OF DELTA V (LV) COMPONENTS MAY HAVE RESULTED
R0047 IN AN OUT-OF-PLANE MANEUVER.

R0048 (2) STATE VECTOR UPDATED BY P27 ARE DISALLOWED DURING AUTOMATIC
R0049 STATE VECTOR UPDATING INITIATED BY P20 (SEE ASSUMPTION (4)).

R0050 (3) THIS PROGRAM MUST BE DONE OVER A TRACKING STATION FOR REAL
R0051 TIME GROUND PARTICIPATION IN DATA INPUT AND OUTPUT. COMPUTED
R0052 VARIABLES MAY BE STORED FOR LATER VERIFICATION BY THE GROUND.
R0053 THESE STORAGE CAPABILITIES ARE LIMITED ONLY TO THE PARAMETERS
R0054 FOR ONE THRUSTING MANEUVER AT A TIME EXCEPT FOR CONCENTRIC
R0055 FLIGHT PLAN MANEUVER SEQUENCES.

R0056 (4) THE RENDEZVOUS RADAR MAY OR MAY NOT BE USED TO UPDATE THE LM
R0057 OR CSM STATE VECTORS FOR THIS PROGRAM. IF RADAR USE IS
R0058 DESIRED THE RADAR WAS TURNED ON AND LOCKED ON THE CSM BY
R0059 PREVIOUS SELECTION OF P20. RADAR SIGHTING MARKS WILL BE MADE
R0060 AUTOMATICALLY APPROXIMATELY ONCE A MINUTE WHEN ENABLED BY THE
R0061 TRACK AND UPDATE FLAGS (SEE P20). THE RENDEZVOUS TRACKING
R0062 MARK COUNTER IS ZEROED BY THE SELECTION OF P20 AND AFTER EACH
R0063 THRUSTING MANEUVER.

R0064 (5) THE ISS NEED NOT BE ON TO COMPLETE THIS PROGRAM.

R0065 (6) THE OPERATION OF THE PROGRAM UTILIZES THE FOLLOWING FLAGS -

R0066 ACTIVE VEHICLE FLAG - DESIGNATES THE VEHICLE WHICH IS
R0067 DOING RENDEZVOUS THRUSTING MANEUVERS TO THE PROGRAM WHICH
R0068 CALCULATES THE MANEUVER PARAMETERS. SET AT THE START OF
R0069 EACH RENDEZVOUS PRE-THRUSTING PROGRAM.

R0070 FINAL FLAG - SELECTS FINAL PROGRAM DISPLAYS AFTER CREW HAS
R0071 SELECTED THE FINAL MANEUVER COMPUTATION CYCLE.

R0072 EXTERNAL DELTA V FLAG - DESIGNATES THE TYPE OF STEERING
R0073 REQUIRED FOR EXECUTION OF THIS MANEUVER BY THE THRUSTING
R0074 PROGRAM SELECTED AFTER COMPLETION OF THIS PROGRAM.

R0075 (7) ONCE THE PARAMETERS REQUIRED FOR COMPUTATION OF THE MANEUVER
R0076 HAVE BEEN COMPLETELY SPECIFIED, THE VALUE OF THE ACTIVE
R0077 VEHICLE CENTRAL ANGLE OF TRANSFER IS COMPUTED AND STORED.
R0078 THIS NUMBER WILL BE AVAILABLE FOR DISPLAY TO THE ASTRONAUT
R0079 THROUGH THE USE OF V06N52.

R0080 THE ASTRONAUT WILL CALL THIS DISPLAY TO VERIFY THAT THE
R0081 CENTRAL ANGLE OF TRANSFER OF THE ACTIVE VEHICLE IS NOT WITHIN



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R0082 170 TO 190 DEGREES. IF THE ANGLE IS WITHIN THIS ZONE THE
R0083 ASTRONAUT SHOULD REASSESS THE INPUT TARGETING PARAMETERS BASED
R0084 UPON DELTA V AND EXPECTED MANEUVER TIME.

R0085 (8) THIS PROGRAM IS SELECTED BY THE ASTRONAUT BY DSKY ENTRY -

R0086 P34 IF THIS VEHICLE IS ACTIVE VEHICLE.

R0087 P74 IF THIS VEHICLE IS PASSIVE VEHICLE.

R0088 INPUT

R0089 (1) TTPI TIME OF THE TPI MANEUVER
R0090 (2) ELEV DESIRED LOS ANGLE AT TPI
R0091 (3) CENTANG ORBITAL CENTRAL ANGLE OF THE PASSIVE VEHICLE DURING
R0092 TRANSFER FROM TPI TO TIME OF INTERCEPT

R0093 OUTPUT

R0094 (1) TRMKCNT NUMBER OF MARKS
R0095 (2) TTOGO TIME TO GO
R0098 (3) +MGA MIDDLE GIMBAL ANGLE
R0097 (4) TTPI COMPUTED TIME OF TPI MANEUVER
R0098 OR
R0099 ELEV COMPUTED LOS ANGLE AT TPI
R0100 (5) POSTTPI PERIGEE ALTITUDE AFTER THE TPI MANEUVER
R0101 (6) DELVTPI MAGNITUDE OF DELTA V AT TPI
R0102 (7) DELVTPI MAGNITUDE OF DELTA V AT INTERCEPT
R0103 (8) DVLOS DELTA VELOCITY AT TPI - LINE OF SIGHT
R0104 (9) DELVLVC DELTA VELOCITY AT TPI - LOCAL VERTICAL COORDINATES

R0105 DOWNLINK

R0114 (1) TTPI TIME OF THE TPI MANEUVER
R0115 (2) TIG TIME OF THE TPI MANEUVER
R0118 (3) ELEV DESIRED LOS ANGLE AT TPI
R0117 (4) CENTANG ORBITAL CENTRAL ANGLE OF THE PASSIVE VEHICLE DURING
R0118 TRANSFER FROM TPI TO TIME OF INTERCEPT
R0119 (5) DELVEET3 DELTA VELOCITY AT TPI - REFERENCE COORDINATES
R0120 (8) TPASS4 TIME OF INTERCEPT
R0121 COMMUNICATION TO THRUSTING PROGRAMS

R0122 (1) TIG TIME OF THE TPI MANEUVER
R0123 (2) RTARG OFFSET TARGET POSITION
R0124 (3) TPASS4 TIME OF INTERCEPT
R0125 (4) XDDELVLG RESET TO INDICATE LAMBERT (AIMPOINT) VG COMPUTATION

R0126 SUBROUTINES USED

R0127 AVPLAGA



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R0128 AVFLAGP
R0129 VNPOOH
R0130 DISPLAYE
R0131 SELECTMU
R0132 PRECSET
R0133 S33/34.1
R0134 ALARM
R0135 BANKCALL
R0136 COFLASH
R0137 GOTOPOOH
R0138 TIMETHET
R0139 S34/35.2
R0140 PERIAP01
R0141 SHIPTR1
R0142 S34/35.5
R0143 VN1845

0144 REP 1 35,2000 SETLOC CSI/CDH
0145 35,2000 BANK
0146 REP 5 LAST 249 E4,1770 EBANK= SUBEXIT
0147 REP 1 COUNT 35/P3474

0146 REP 1 35,2000 0 3726 1 P34 TC AVFLAGA
0149 REP 1 35,2001 0 2003 0 TC P34/P74A
0150 REP 1 35,2002 0 3741 0 P74 TC AVFLAGP
0151 REP 1 35,2003 0 3748 1 P34/P74A TC P20FLGON
01515 REP 1 35,2004 3 3125 1 CAP V06N37
0152 REP 1 35,2005 0 3114 0 TC VNPOOH
0153 REP 1 35,2006 0 3073 0 TC DISPLAYE
0154 REP 40 LAST 451 35,2007 0 6006 1 TC INTERPRET
0155 35,2010 71214 0 CLEAR DLOAD
0156 REP 3 LAST 48 35,2011 01270 0 ETPIFLAG
0157 REP 4 LAST 267 35,2012 03663 1 TIPI
0158 REP 16 LAST 267 35,2013 17413 1 STODL TIG
0159 REP 5 LAST 275 35,2014 03744 0 ELEV
0160 35,2015 43054 1 BZE SET
0161 REP 1 35,2016 72020 0 P34/P74B
0162 REP 4 LAST 455 35,2017 01070 1 ETPIFLAG
0163 35,2020 77624 1 P34/P74B CALL
0164 REP 1 35,2021 10716 0 SELECTMU
0165 0032 DELELO EQUALS 26D
0166 35,2022 43145 0 P34/P74C DLOAD SET
0167 REP 2 LAST 31 35,2023 15332 1 ZEROVECS
0168 REP 1 35,2024 03461 1 ITSWICH
0169 35,2025 43014 0 BDN CLEAR
0170 REP 5 LAST 455 35,2026 01310 1 ETPIFLAG
0171 REP 1 35,2027 72031 0 SWCHSET
0172 REP 2 LAST 455 35,2030 03661 0 ITSWICH
0173 REP 1 35,2031 02364 1 SWCHSET STORE NOMTIPI
0174 35,2032 43345 1 INTLOOP DLOAD DAD

SET UPDATIFLG, TRACKFLG
TIPI

ELEV AND CENTANG



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0175 REP 5 LAST 455 35,2033 03683 1
0176 REP 2 LAST 455 35,2034 02364 1
0177 REP 4 LAST 450 35,2035 34041 0
0178 REP 1 35,2036 45354 1
0179 35,2037 77624 1
0180 REP 1 35,2040 72212 0
0181 35,2041 77454 1
0182 REP 1 35,2042 72053 1
0183 REP 24 LAST 444 35,2043 0 5537 0
0184 35,2044 00611 1
0185 REP 1 35,2045 3 4743 0
0186 REP 67 LAST 451 35,2046 0 4555 0
0187 REP 10 LAST 451 35,2047 20624 0
0188 REP 7 LAST 451 35,2050 0 4106 1
0189 REP 2 LAST 455 35,2051 0 2003 0
0190 35,2052 0 2043 1

TTP1
NOMTP1
STCALL TDEC1
PRECSET
CALL
S33/34.1
EXIT
SWOCLR
TC ALARM
OCT 611
CAP V05N09
TC BANKCALL
CADR GCPFLASH
TC GOTOPOCH
TC P34/P74A
TC -7

PROCEED
V32

0191 35,2053 43014 0
0192 REP 3 LAST 455 35,2054 03601 0
0193 REP 1 35,2055 72032 0
0194 REP 6 LAST 455 35,2056 01310 1
0195 REP 1 35,2057 72063 1
0196 35,2060 77776 1
0197 REP 2 LAST 455 35,2061 0 3073 0
0198 REP 1 35,2062 0 2066 0
0199 35,2063 77776 1
0200 REP 2 LAST 455 35,2064 3 3125 1
0201 REP 2 LAST 455 35,2065 0 3114 0
0202 REP 41 LAST 455 35,2066 0 6006 1
0203 35,2067 71201 1
0204 35,2070 00001 0
0205 REP 2 LAST 124 35,2071 03746 1
0206 REP 2 LAST 434 35,2072 14047 1
0207 REP 4 LAST 275 35,2073 03754 1
0208 35,2074 71406 0
0209 REP 2 LAST 94 35,2075 16734 0
0210 35,2076 77756 0
0211 REP 2 LAST 94 35,2077 26732 0
0212 REP 2 LAST 120 35,2100 03554 0
0213 35,2101 77657 0
0214 35,2102 57176 0
0215 REP 1 35,2103 26657 1
0216 REP 2 LAST 120 35,2104 03562 0
0217 35,2105 43057 1
0218 35,2106 57176 0
0219 REP 1 35,2107 03466 0
0220 REP 2 LAST 94 35,2110 36746 1
0221 REP 1 35,2111 24737 1
0222 35,2112 77745 1
0223 REP 6 LAST 456 35,2113 03663 1

SWOCLR BONCLR BON
ITSWICH
INTLOOP
ETPIFLAG
P34/P74D
EXIT
TC DISPLAYE
TC P34/P74E
P34/P74D EXIT
CAP V06N37
TC VNPOCH
P34/P74E TC INTPRET
SETPO DLOAD
00
RTX1
STOVL X1
CENTANG
PUSH COS
STOVL CSTH
SIN
STOVL SNTH
RPASS3
VSR*
0,2
STOVL RVFC
VPASS3
VSR* SET
0,2
RVSW
STCALL VVEC
TIMETHET
DLOAD
TTP1

DISPLAY TTP1

DISPLAY ELEV AND CENTANG

TTP1



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0224	REP	2	LAST	121	35,2114	03503 1
0225					35,2115	77615 0
0226	REP	1			35,2116	00037 0
0227	REP	4	LAST	171	35,2117	37656 0
0228	REP	1			35,2120	72534 0
0229					35,2121	51575 1
0230	REP	4	LAST	171	35,2122	03646 0
0231	REP	4	LAST	275	35,2123	26635 0
0232	REP	2	LAST	121	35,2124	03640 0
0233					35,2125	51451 0
0234	REP	3	LAST	121	35,2126	03620 0
0235	REP	4	LAST	275	35,2127	26637 1
0236	REP	3	LAST	120	35,2130	03540 0
0237					35,2131	45115 0
0238	REP	3	LAST	121	35,2132	03612 1
0239	REP	1			35,2133	45312 0
0240					35,2134	77624 1
0241	REP	1			35,2135	45422 1
0242	REP	2	LAST	275	35,2136	16641 0
0243	REP	7	LAST	456	35,2137	03663 1
0244	REP	17	LAST	455	35,2140	03413 1
0245					35,2141	77776 1
0246	REP	1			35,2142	3 3127 0
0247	REP	3	LAST	456	35,2143	0 3114 0
0248	REP	42	LAST	456	35,2144	0 6006 1
0249					35,2145	77624 1
0250	REP	1			35,2146	72742 0
0251					35,2147	77624 1
0252	REP	1			35,2150	73005 0
0253					35,2151	77650 1
0254	REP	1			35,2152	72022 1

STORE	INTIME
DAD	
	T
STCALL	TPASS4
	S34/35.2
VLOAD	ABVAL
	DELVEET3
STOVL	DELVTPI
	VPASS4
VSU	ABVAL
	VTPRIME
STOVL	DELVTTP
	RACT3
PDVL	CALL
	VIPRIME
	PERIAP01
CALL	
	SHIFTR1
STOVL	POSTTPI
	TTPI
STORE	TIG
EXIT	
CAP	V06N58
TC	VNPOCH
TC	INTPRET
CALL	
	S34/35.5
CALL	
	VN1645
GOTO	
	P34/P74C

FOR INITVEL
RENDEZVOUS TIME
FOR INITVEL



L P34-P35, P74-P75

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P0255 RENDEZVOUS MID-COURSE MANEUVER PROGRAMS (P35 AND P75)

R0256 MOD NO -1 LOG SECTION - P32-P35, P72-P75

R0257 MOD BY WHITE.P DATE 1JUN67

R0258 PURPOSE

R0259 (1) TO CALCULATE THE REQUIRED DELTA V AND OTHER INITIAL CONDITIONS
R0260 REQUIRED BY THE ACTIVE VEHICLE FOR EXECUTION OF THE NEXT
R0261 MIDCOURSE CORRECTION OF THE TRANSFER PHASE OF AN ACTIVE
R0262 VEHICLE RENDEZVOUS.

R0263 (2) TO DISPLAY TO THE ASTRONAUT AND THE GROUND CERTAIN DEPENDENT
R0264 VARIABLES ASSOCIATED WITH THE MANEUVER FOR APPROVAL BY THE
R0265 ASTRONAUT/GROUND.

R0266 (3) TO STORE THE TFM TARGET PARAMETERS FOR USE BY THE DESIRED
R0267 THRUSTING PROGRAM.

R0268 ASSUMPTIONS

R0269 (1) THE ISS NEED NOT BE ON TO COMPLETE THIS PROGRAM.

R0270 (2) STATE VECTOR UPDATES BY P27 ARE DISALLOWED DURING AUTOMATIC
R0271 STATE VECTOR UPDATING INITIATED BY P20 (SEE ASSUMPTION (3)).

R0272 (3) THE RENDEZVOUS RADAR IS ON AND IS LOCKED ON THE CSM. THIS WAS
R0273 DONE DURING PREVIOUS SELECTION OF P20. RADAR SIGHTING MARKS
R0274 WILL BE MADE AUTOMATICALLY APPROXIMATELY ONCE A MINUTE WHEN
R0275 ENABLED BY THE TRACK AND UPDATE FLAGS (SEE P20). THE
R0276 RENDEZVOUS TRACKING MARK COUNTER IS ZEROED BY THE SELECTION OF
R0277 P20 AND AFTER EACH THRUSTING MANEUVER.

R0278 (4) THE OPERATION OF THE PROGRAM UTILIZES THE FOLLOWING FLAGS -

R0279 ACTIVE VEHICLE FLAG - DESIGNATES THE VEHICLE WHICH IS
R0280 DOING RENDEZVOUS THRUSTING MANEUVERS TO THE PROGRAM WHICH
R0281 CALCULATES THE MANEUVER PARAMETERS. SET AT THE START OF
R0282 EACH RENDEZVOUS PRE-THRUSTING PROGRAM.

R0283 FINAL FLAG - SELECTS FINAL PROGRAM DISPLAYS AFTER CREW HAS
R0284 SELECTED THE FINAL MANEUVER COMPUTATION CYCLE.

R0285 EXTERNAL DELTA V FLAG - DESIGNATES THE TYPE OF STEERING
R0286 REQUIRED FOR EXECUTION OF THIS MANEUVER BY THE THRUSTING
R0287 PROGRAM SELECTED AFTER COMPLETION OF THIS PROGRAM.

R0288 (5) THE TIME OF INTERCEPT (T(INT)) WAS DEFINED BY PREVIOUS
R0289 COMPLETION OF THE TRANSFER PHASE INITIATION (TPI) PROGRAM
R0290 (P34/P74) AND IS PRESENTLY AVAILABLE IN STORAGE.



L P34-P35, P74-P75

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R0291 (6) ONCE THE PARAMETERS REQUIRED FOR COMPUTATION OF THE MANEUVER
R0292 HAVE BEEN COMPLETELY SPECIFIED, THE VALUE OF THE ACTIVE
R0293 VEHICLE CENTRAL ANGLE OF TRANSFER IS COMPUTED AND STORED.
R0294 THIS NUMBER WILL BE AVAILABLE FOR DISPLAY TO THE ASTRONAUT
R0295 THROUGH THE USE OF V08N52.

R0296 THE ASTRONAUT WILL CALL THIS DISPLAY TO VERIFY THAT THE
R0297 CENTRAL ANGLE OF TRANSFER OF THE ACTIVE VEHICLE IS NOT WITHIN
R0298 170 TO 190 DEGREES. IF THE ANGLE IS WITHIN THIS ZONE THE
R0299 ASTRONAUT SHOULD REASSESS THE INPUT TARGETING PARAMETERS BASED
R0300 UPON DELTA V AND EXPECTED MANEUVER TIME.

R0301 (7) THIS PROGRAM IS SELECTED BY THE ASTRONAUT BY DSKY ENTRY -

R0302 P35 IF THIS VEHICLE IS ACTIVE VEHICLE.

R0303 P75 IF THIS VEHICLE IS PASSIVE VEHICLE.

R0304 INPUT

R0305 (1) TPASS4 TIME OF INTERCEPT - SAVED FROM P34/P74

R0306 OUTPUT

R0307 (1) TRKRCNT NUMBER OF MARKS
R0308 (2) TTOGO TIME TO GO
R0309 (3) AMGA MIDDLE GIMBAL ANGLE
R0310 (4) DVLOS DELTA VELOCITY AT MID - LINE OF SIGHT
R0311 (5) DELVLC DELTA VELOCITY AT MID - LOCAL VERTICAL COORDINATES

R0312 DOWNLINK

R0325 (1) TIG TIME OF THE TPM MANEUVER
R0326 (2) DELVEET3 DELTA VELOCITY AT TPM - REFERENCE COORDINATES
R0327 (3) TPASS4 TIME OF INTERCEPT
R0328 COMMUNICATION TO THRUSTING PROGRAMS

R0329 (1) TIG TIME OF THE TPM MANEUVER
R0330 (2) RTARG OFFSET TARGET POSITION
R0331 (3) TPASS4 TIME OF INTERCEPT
R0332 (4) XDELVPLG RESET TO INDICATE LAMBERT (AIMPOINT) VG COMPUTATION

R0333 SUBROUTINES USED

R0334 AVPLAGA
R0335 AVPLAGP
R0336 LOADTIME
R0337 SELECTIMU
R0338 PRECSET
R0339 S34/35.1
R0340 S34/35.2



L P34-P35, P74-P75

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R0341 S34/35.5
R0342 VN1645

0343	REF	1					COUNT	35/P3575	
0344	REF	6	LAST	202	E4,1763		BRANK=	KT	
0345	REF	2	LAST	455	35,2153	0 3728 1	P35	TC	AVFLAGA
0346					35,2154	0 0008 1		EXTEND	
0347	REF	1			35,2155	3 1422 1		DCA	ATIGINC
0348	REF	1			35,2156	0 2162 0		TC	P35/P75A
0349	REF	2	LAST	455	35,2157	0 3741 0	P75	TC	AVFLAGP
0350					35,2160	0 0008 1		EXTEND	
0351	REF	1			35,2161	3 1424 1		DCA	PTIGINC
0352	REF	7	LAST	460	35,2162	53*764 1	P35/P75A	DXCH	KT
03525	REF	2	LAST	455	35,2163	0 3746 1		TC	P20FLGON
0353	REF	43	LAST	457	35,2164	0 6008 1		TC	INTPRET
0359					35,2165	77624 1		CALL	
0360	REF	2	LAST	455	35,2166	10716 0		SELECTMU	
0361					35,2167	77634 0	P35/P75B	RTB	
0362	REF	3	LAST	423	35,2170	45505 0		LOADTIME	
03621	REF	3	LAST	123	35,2171	03685 1		STORE	TSIRT
03622					35,2172	77615 0		DAD	
03623	REF	6	LAST	460	35,2173	02364 1		KT	
03624	REF	16	LAST	457	35,2174	03413 1		STORE	TIG
0363	REF	3	LAST	457	35,2175	03503 1		STORE	INTIME
0364	REF	5	LAST	456	35,2176	34041 0		STCALL	TDEC1
0365	REF	2	LAST	456	35,2177	45354 1		PRECSET	
0366					35,2200	77624 1		CALL	
0367	REF	1			35,2201	72522 1		S34/35.1	
0368					35,2202	77624 1		CALL	
0369	REF	2	LAST	457	35,2203	72534 0		S34/35.2	
0370					35,2204	77624 1		CALL	
0371	REF	2	LAST	457	35,2205	72742 0		S34/35.5	
0372					35,2206	77624 1		CALL	
0373	REF	2	LAST	457	35,2207	73005 0		VN1645	
0379					35,2210	77650 1		GOTO	
0360	REF	1			35,2211	72167 1		P35/P75B	

SET UPDATPLG, TRACKPLG

FOR INITVEL

ADVANCE BOTH VEHICLES

GET NORM AND LOS FOR TRANSFORM

GET DELTA V(LV)



L P34-P35, P74-P75

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P0361 S33/34.1

0362				35,2212	66220 1	S33/34.1 STO	SSP	
0363	REF	1		35,2213	01340 1		NORMEX	
0364	REF	2	LAST 123	35,2214	03665 1		TITER	
0365				35,2215	40000 0	OCT	40000	
0366				35,2216	40345 1	DLOAD	SETPD	
0367	REF	1		35,2217	33136 0		MAX250	
0368				35,2220	00001 0		OD	
0369	REF	2	LAST 120	35,2221	27454 1	STOVL	SECMA	
0390	REF	4	LAST 457	35,2222	03540 0		RACT3	
0391	REF	1		35,2223	27576 0	STOVL	RAPREC	
0392	REF	2	LAST 120	35,2224	03546 0		VACT3	
0393	REF	1		35,2225	27570 0	STOVL	VAPREC	
0394	REF	3	LAST 456	35,2226	03554 0		RPASS3	
0395	REF	1		35,2227	27620 0	STOVL	RPPREC	
0396	REF	3	LAST 456	35,2230	03562 0		VPASS3	
0397	REF	1		35,2231	03612 1	STORE	VPPREC	
0398				35,2232	77624 1	ELCALC	CALL	
0399	REF	2	LAST 460	35,2233	72522 1		S34/35.1	NORMAL AND LOS
0400				35,2234	63235 0	VXV	PDVL	
0401	REF	5	LAST 461	35,2235	03540 0		RACT3	(RA*VA)*RA OD
0402				35,2236	53515 0	PDVL	UNIT	ULOS AT 6D
0403	REF	6	LAST 461	35,2237	03540 0		RACT3	
0404				35,2240	46315 1	PDVL	VPROJ	XCHNJ AND UP
0405				35,2241	51352 1	VSL2	BVSU	
0406	REF	2	LAST 91	35,2242	02625 1		ULOS	
0407				35,2243	63256 0	UNIT	PDVL	UP AT OD
0408				35,2244	63241 0	DOT	PDVL	UP.UN*RA AT OD
0409				35,2245	00001 0		OD	UP IN MPAC
0410				35,2246	75241 1	DOT	SIGN	
0411	REF	3	LAST 461	35,2247	02625 1		ULOS	
0412				35,2250	65552 0	SL1	ACOS	
0413				35,2251	50315 0	PDVL	DOT	EA AT OD
0414	REF	4	LAST 461	35,2252	02625 1		ULOS	
0415	REF	7	LAST 461	35,2253	03540 0		RACT3	
0416				35,2254	71244 0	BPL	DLOAD	
0417	REF	1		35,2255	72260 0		TESTY	
0418	REF	2	LAST 421	35,2256	15340 1		DPPOS*AX	
0419				35,2257	41425 1	DSU	PUSH	
0420				35,2260	71214 0	BOFF	DLOAD	
0421	REF	4	LAST 456	35,2261	03741 0	TESTY	ITSWICH	
0422	REF	1		35,2262	72507 0		ELEX	
0423	REF	2	LAST 120	35,2263	03452 1		DELEL	
0424	REF	1		35,2264	14033 1	STOVL	DELELO	
0425				35,2265	77625 0	DSU		
0426	REF	6	LAST 455	35,2266	03744 0		ELRV	
0427	REF	3	LAST 461	35,2267	03452 1	STORE	DELEL	
0428				35,2270	45246 0	ABS	DSU	
0429	REF	1		35,2271	33142 0		ELRPS	



L P34-P35, P74-P75

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0430				35,2272	77640 0	RMN		
0431	REF	1		35,2273	72517 1		TIMEX	COMMERCIALS EVERYWHERE
0432				35,2274	70535 0	PIGTIME	SLOAD	
0433	REF	3	LAST	461	35,2275	03685 1		TITER
0434				35,2276	72030 1	BHIZ	LXA,1	
0435	REF	2	LAST	461	35,2277	01340 1		NORMEX
0436	REF	235	LAST	447	35,2300	00154 1		MPAC
0437				35,2301	77330 1	SCA,1	VLOAD	TOO MANY ITERATIONS
0438	REF	4	LAST	462	35,2302	03684 0		TITER
0439	REF	4	LAST	461	35,2303	03554 0		RPASS3
0440				35,2304	85256 0	UNIT	PDOL	
0441				35,2305	00045 0		36D	
0442				35,2306	53515 0	PDVL	UNIT	
0443	REF	8	LAST	461	35,2307	03540 0		RACT3
0444				35,2310	77725 1	PDOL		
0445				35,2311	41525 0	PDOL	PUSH	
0446				35,2312	00045 0		36D	
0447				35,2313	77621 1	BDSU		
0448				35,2314	00015 0		12D	
0449				35,2315	14037 0	STOOL	30D	RP - RA MAGNITUDES
0450	REF	7	LAST	403	35,2316	15330 0		DPHALP
0451				35,2317	41425 1	DSU	PUSH	
0452	REF	7	LAST	461	35,2320	03744 0		ELEV
0453				35,2321	50165 0	SIGN	RMN	
0454				35,2322	00037 0		30D	
0455	REF	3	LAST	462	35,2323	01340 1		NORMEX
0456				35,2324	71545 0	DLOAD	COS	
0457				35,2325	56205 0	DMP	DDV	
0458				35,2326	00017 1		14D	
0459				35,2327	00015 0		12D	
0460				35,2330	77678 0	DCOMP		SINCE COS(160-A)=-COS A
0461				35,2331	00035 1	STORE	28D	
0462				35,2332	44246 1	ABS	BDSU	
0463	REF	8	LAST	462	35,2333	15330 0		DPHALP
0464				35,2334	77240 1	RMN	VLOAD	
0465	REF	4	LAST	462	35,2335	01340 1		NORMEX
0466	REF	2	LAST	91	35,2336	02617 0		UNRM
0467				35,2337	53435 0	VXV	UNIT	UN*RA
0468				35,2340	00007 0		6D	
0469				35,2341	41241 0	DOT	DMP	
0470	REF	3	LAST	461	35,2342	03546 0		VACT3
0471				35,2343	00015 0		12D	
0472				35,2344	47315 0	PDVL	VXV	
0473				35,2345	00001 0		0D	
0474	REF	4	LAST	461	35,2346	03562 0		VPASS3
0475				35,2347	53435 0	VXV	UNIT	(RP*VP)*RP
0476				35,2350	00001 0		0D	
0477				35,2351	41241 0	DOT	DMP	
0478	REF	5	LAST	462	35,2352	03562 0		VPASS3
0479				35,2353	00017 1		14D	



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E4 83

0480 35,2354 77621 1
0481 35,2355 63301 0
0482 REF 3 LAST 456 35,2356 00047 1
0483 35,2357 00007 0
0484 35,2360 50235 0
0485 35,2361 00001 0
0486 REF 3 LAST 462 35,2362 02617 0
0487 35,2363 50315 0
0488 35,2364 00001 0
0489 35,2365 00007 0
0490 35,2366 65552 0
0491 35,2367 77765 0
0492 35,2370 43225 0
0493 REF 9 LAST 462 35,2371 15330 0
0494 REF 8 LAST 462 35,2372 03744 0
0495 35,2373 65525 0
0496 35,2374 00035 1
0497 35,2375 75221 1
0498 REF 10 LAST 463 35,2376 15330 0
0499 35,2377 00037 0
0500 35,2400 77615 0
0501 35,2401 56205 0
0502 REF 1 35,2402 33134 1
0503 35,2403 77605 1
0504 35,2404 41257 1
0505 35,2405 20176 0
0506 35,2406 51406 1
0507 35,2407 50025 0
0508 REF 3 LAST 461 35,2410 03454 1
0509 REF 1 35,2411 72415 1
0510 35,2412 75345 1
0511 REF 4 LAST 463 35,2413 03454 1
0512 35,2414 77606 1
0513 35,2415 51135 1
0514 REF 5 LAST 462 35,2416 03665 1
0515 REF 1 35,2417 72425 1
0516 35,2420 71331 0
0517 REF 6 LAST 463 35,2421 03665 1
0518 35,2422 37777 1
0519 35,2423 77650 1
0520 REF 1 35,2424 72463 0
0521 35,2425 41345 0
0522 REF 4 LAST 461 35,2426 03452 1
0523 REF 2 LAST 461 35,2427 00033 1
0524 35,2430 71244 0
0525 REF 1 35,2431 72441 0
0526 REF 5 LAST 463 35,2432 03454 1
0527 35,2433 77605 1
0528 REF 1 35,2434 33140 1
0529 REF 6 LAST 463 35,2435 17454 1

BDSU
NORM PDVL
X1
6D
VXV DOT
6D
PDVL UNRM
DOT
6D
6D
SL1 ACOS
SIGN
DSU DAD
DPHALP
ELEV
PDOL ACOS
28D
BDSU SIGN
DPHALP
30D
DAD
DMP DDV
TWOPI
DMP
SL* DMP
0 -3,1
PUSH ABS
DSU RMN
SEC MAX
QMAX
DLOAD SIGN
SEC MAX
PUSH
SLOAD BPL
TITER
REPETE
SSP DLOAD
TITER
OCT 37777
GOTO
STORDEL T
REPETE DLOAD
DMP
DELEL
DELELO
BPL DLOAD
NEXTES
SEC MAX
DMP
THIRD
STODL SEC MAX

NORMALIZED WA - WP 12D

RA*RP.UN 14D

ALPHA PI

CONTAINS RP-RA

REPLACE TIME WITH MAX TIME SIGNED

TEST FIRST ITERATION



L P34-P35, P74-P75

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0530				35,2436	70446 0	ABS	SR1
0531				35,2437	52076 1	DCOMP	GOTO
0532	REP	1		35,2440	72451 1		RESIGN
0533				35,2441	51545 1	NEXTES	DLOAD
0534	REP	5	LAST	463	35,2442	03452 1	ABS
0535				35,2443	51525 1	PDDL	DELEL
0536	REP	3	LAST	463	35,2444	00033 1	ABS
0537				35,2445	77625 0		DELELO
0538				35,2446	71240 1	DSU	
0539	REP	1		35,2447	72454 1	BNN	DLOAD
0540				35,2450	77646 0		REVERS
0541				35,2451	52165 1	ABS	
0542	REP	2	LAST	120	35,2452	03450 0	SIGN
0543	REP	2	LAST	463	35,2453	72463 0	GOTO
0544				35,2454	57545 1	REVERS	DELTEEO
0545	REP	3	LAST	464	35,2455	03450 0	STOREDEL
0546				35,2456	70406 1		DCOMP
0547	REP	4	LAST	464	35,2457	03450 0	DELTEEO
0548				35,2460	77615 0	PUSH	SR1
0549				35,2461	77650 1	STORE	DELTEEO
0550	REP	1		35,2462	72464 1	DAD	
0551	REP	5	LAST	464	35,2463	03450 0	GOTO
0552				35,2464	77615 0	STOREDEL	ADTIME
0553	REP	3	LAST	456	35,2465	02364 1	DAD
0554	REP	4	LAST	464	35,2466	02364 1	ADTIME
0555				35,2467	63375 0		NOMTPI
0556	REP	2	LAST	461	35,2470	03570 0	STORE
0557	REP	2	LAST	461	35,2471	03576 0	NOMTPI
0558				35,2472	77624 1	VLOAD	PDVL
0559	REP	1		35,2473	72702 1		VAPREC
0560				35,2474	77624 1	CALL	RAPREC
0561	REP	1		35,2475	45376 1		
0562				35,2476	63375 0	CALL	GOINT
0563	REP	2	LAST	461	35,2477	03612 1	GOINT
0564	REP	2	LAST	461	35,2500	03620 0	ACTIVE
0565				35,2501	77624 1	VLOAD	PDVL
0566	REP	2	LAST	464	35,2502	72702 1	VPPREC
0567				35,2503	77624 1	CALL	RPPREC
0568	REP	1		35,2504	45406 1		
0569				35,2505	77650 1	CALL	GOINT
0570	REP	1		35,2506	72232 1		PASSIVE
0571				35,2507	43345 1	GOTO	
0572	REP	8	LAST	457	35,2510	03663 1	ELCALC
0573	REP	5	LAST	464	35,2511	02364 1	DAD
0574	REP	9	LAST	464	35,2512	17663 1	TPI
0575				35,2513	77614 1	STOOL	NOMTPI
0576	REP	7	LAST	456	35,2514	01310 1	TPI
0577	REP	2	LAST	462	35,2515	72517 1	ETPIFLAG
0578	REP	9	LAST	463	35,2516	03744 0	TIMEX
0579				35,2517	52145 0	STORE	ELFV
						DLOAD	GOTO

CROSSED OVER SOLUTION
DT=(-SIGN(DTO)/DT//)/2

WRONG DIRECTION

SUM OF DELTA T'S

STORE NEW RACT3 VACT3

STORE NEW RPASS3 VPASS3



ASSEMBLE REVISION 249 OF AGC PROGRAM COLOSSUS BY NASA 2021111-041

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L P34-P35, P74-P75

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0580	REP	3	LAST	455	35,2520	15332 1
0581	REP	5	LAST	462	35,2521	01340 1

ZEROVECS
NORMEX



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P0582 S34/35.1

R0583 COMPUTE UNIT NORMAL AND LINE OF SIGHT VECTORS GIVEN THE ACTIVE AND

R0584 PASSIVE POS AND VEL AT TIME T3

0585					35,2522	52375 1	S34/35.1 VLOAD	VSU
0586	REP	5	LAST	482	35,2523	03554 0		RPASS3
0587	REP	9	LAST	482	35,2524	03540 0		RACT3
0588					35,2525	41458 0	UNIT	PUSH
0589	REP	5	LAST	481	35,2528	28825 1	STOVL	ULOS
0590	REP	10	LAST	486	35,2527	03540 0		RACT3
0591					35,2530	53435 0	VXV	UNIT
0592	REP	4	LAST	482	35,2531	03546 0		VACT3
0593	REP	4	LAST	483	35,2532	02817 0	STORE	UNRM
0594					35,2533	77818 0	RVO	



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P0595 S34/35.2

R0596 ADVANCE PASSIVE VEH TO REDESVUOUS TIME AND GET R20 VEL FROM LAMBERT

0597				35,2534	77220 1	S34/35.2 STO	VLOAD	
0598	REP	6	LAST	455	35,2535	02370 1	SUBEXIT	
0599	REP	6	LAST	462	35,2538	03562 0	VPASS3	
0600				35,2537	65315 0	PDVL	PDOL	
0601	REP	6	LAST	468	35,2540	03554 0	RPASS3	
0602	REP	4	LAST	480	35,2541	03503 1	INTIME	
0603				35,2542	65325 0	PDOL	PDOL	
0604	REP	5	LAST	457	35,2543	03358 1	TPASS4	
0605	REP	4	LAST	465	35,2544	15332 1	ZEROVECS	
0606				35,2545	45008 0	PUSH	CALL	
0607	REP	1		35,2546	72708 0	INTINT	GET TARGET VECTOR	
0608	REP	4	LAST	171	35,2547	27415 1	S3435.25 STOVL	RTARG
0609	REP	1		35,2550	00007 0	VATT		
0610	REP	3	LAST	457	35,2551	27040 0	STOVL	VPASS4
0611	REP	5	LAST	487	35,2552	03415 1	RTARG	
R0612	COMPUTE PH1 = P1 + (ACOS(UNIT RA, UNIT RP) - P1) SIGN(RA*RP, U)							
0613				35,2553	63258 0	UNIT	PDVL	UNIT RP
0614	REP	11	LAST	466	35,2554	03540 0	RACT3	
0615				35,2555	41458 0	UNIT	PUSH	UNIT RA
0616				35,2556	50235 0	VXV	DOT	
0617				35,2557	00001 0	QD		
0618	REP	5	LAST	488	35,2560	02817 0	UNRM	RA*RP, U
0619				35,2561	77715 1	PDVL		
0620				35,2562	72441 0	DOT	SL1	UNIT RA, UNIT RP
0621				35,2563	00001 0	QD		
0622				35,2564	75326 1	ACOS	SIGN	
0623				35,2565	43244 1	BPL	DAD	
0624	REP	1		35,2566	72570 0	NOPIE	NOPIE	
0625	REP	3	LAST	461	35,2567	15340 1	DPPOS MAX	REASONABLE TWO PI
0626	REP	3	LAST	275	35,2570	16833 0	NOPIE	STOVL
0627	REP	6	LAST	467	35,2571	03656 1	ACTCENT	TPASS4
0628				35,2572	77625 0	DSU		
0629	REP	5	LAST	467	35,2573	03503 1	INTIME	
0630	REP	4	LAST	171	35,2574	03423 1	STORE	DELT4
0631				35,2575	40335 0	SLOAD	SETPD	
0632	REP	1		35,2576	33144 0	DECTWO		
0633				35,2577	00001 0	QD		
06331				35,2600	63325 0	PDOL	PDVL	
06332	REP	1		35,2601	33147 0	EPSFOUR		
06333	REP	12	LAST	467	35,2602	03540 0	RACT3	
06334	REP	3	LAST	121	35,2603	27570 0	STOVL	RINIT
06335	REP	5	LAST	466	35,2604	03548 0	VACT3	
06336	REP	3	LAST	121	35,2605	37576 1	STCALL	VINIT
06337	REP	1		35,2606	22000 1	INITVEL		
0634				35,2607	77624 1	CALL		
0635	REP	1		35,2610	72667 0	LQMAT		
0636				35,2611	64375 1	VLOAD	MXV	



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0637	REP	5	LAST	457	35,2612	03646 0	DELVEET3
0638					35,2613	00001 0	0D
0639					35,2614	77772 0	VSL1
0640	REP	7	LAST	277	35,2615	37405 1	STCALL DELALVC
0641	REP	7	LAST	467	35,2616	02370 1	SUBEXIT



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E4 53

P0642 834/35.3

0643				35,2617	45020 1	834/35.3 STD	CALL		
0644	REF	6	LAST	465	35,2620	01340 1	NORMEX		
0645	REF	2	LAST	467	35,2621	72667 0	LMAT	GET MATRIX IN PUSH LIST	
0646				35,2622	61375 1		VLOAD	VXM	
0647	REF	8	LAST	468	35,2623	03405 0	DELVLVC	NEW DEL V TPI	
0648				35,2624	00001 0		QD		
0649				35,2625	77772 0		VSL1		
0650	REF	6	LAST	468	35,2626	03646 0	STORE	DELVEET3	
0651				35,2627	63255 0		VAD	PDVL	
0652	REF	6	LAST	467	35,2630	03546 0		VACT3	SAVE FOR TRANSFORM
0653	REF	13	LAST	467	35,2631	03540 0		RACT3	NEW V REQ
0654				35,2632	65325 0		PDDL	PDDL	
0655	REF	19	LAST	460	35,2633	03413 1		TIG	
0656	REF	7	LAST	467	35,2634	03656 1		TPASS4	
0657				35,2635	41525 0		PDDL	PUSH	
0658	REF	4	LAST	467	35,2636	15340 1		DPPOS MAX	
0659				35,2637	77624 1		CALL		INTEG. FOR NEW TARGET VEC
0660	REF	2	LAST	467	35,2640	72706 0		INTINT	
0661				35,2641	77775 1		VLOAD		
0662	REF	3	LAST	451	35,2642	00001 0		RATT	
0663	REF	6	LAST	467	35,2643	03415 1		RTARG	
0664				35,2644	41575 0	NOVRWRT	VLOAD	PUSH	
0665	REF	6	LAST	466	35,2645	02625 1		ULOS	
0666				35,2646	57435 1		VXV	VCOMP	
0667	REF	6	LAST	467	35,2647	02617 0		UNRM	
0668				35,2650	41456 0		UNIT	PUSH	
0669				35,2651	76435 1		VXV	VSL1	
0670	REF	7	LAST	469	35,2652	02625 1		ULOS	
0671				35,2653	77715 1		PDVL		
0672				35,2654	64315 1		PDVL	MXV	
0673	REF	7	LAST	469	35,2655	03646 0		DELVEET3	
0674				35,2656	00001 0			QD	
0675				35,2657	77772 0		VSL1		
0676	REF	10	LAST	275	35,2660	36611 1	STCALL	DVLOS	
0677	REF	7	LAST	469	35,2661	01340 1		NORMEX	



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P0678 S34/35.4

0679				35,2662	40220 0	S34/35.4 STQ	SETPD	NO ASTRONAUT OVERWRITE
0680	REP	8	LAST	469	35,2663	01340 1	NORMEX	
0681					35,2664	00001 0	OD	
0682					35,2665	77650 1	GOTO	
0683	REP	1			35,2666	72644 1	NOVRWRT	

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P0884 LQMAT

0685				35,2667	57575 1	LQMAT	VLOAD	VCOMP	
0686	REP	7	LAST	469	35,2670		UNRM		
0687					35,2671		STOVL	6D	Y
0688	REP	14	LAST	469	35,2672			RACT3	
0689					35,2673		UNIT	VCOMP	
0690					35,2674		STORE	12D	
0691					35,2675		VXV	VSL1	
0692	REP	8	LAST	471	35,2676		UNRM		Z*-Y
0693					35,2677		STORE	0D	
0694					35,2700		SETPD	RVO	
0695					35,2701			18D	
0696					35,2702		GOINT	PDDL	DO
0697	REP	5	LAST	467	35,2703			ZEROVECS	NOT
0698	REP	6	LAST	464	35,2704			NOMTPI	
0699					35,2705		PUSH	PUSH	ORDER OR INSERT BEFORE INTINT
0700					35,2706		INTINT	STO	
0701	REP	2	LAST	90	35,2707			RTRN	
0702	REP	6	LAST	259	35,2710			INTSTALL	
0703					35,2711		CLEAR	DLOAD	
0704	REP	1			35,2712			INTYPLG	
0705					35,2713		BZE	SET	
0706					35,2714			+2	
0707	REP	2	LAST	471	35,2715			INTYPLG	
0708					35,2716		DLOAD	STADR	
0709	REP	6	LAST	460	35,2717		STOVL	TDEC1	
0710					35,2720		SET	LXA,2	
0711	REP	1			35,2721			MOONFLAG	
0712	REP	2	LAST	124	35,2722			RTX2	
0713					35,2723		RQN	CLEAR	
0714	REP	2	LAST	32	35,2724			MOONFLAG	
0715	REP	1			35,2725			ALLSET	
0716	REP	2	LAST	471	35,2726			MOONFLAG	
0717	REP	4	LAST	264	35,2727		ALLSET	STOVL	
0718					35,2730			VSR*	
0719					35,2731			0,2	
0720	REP	4	LAST	284	35,2732			STOVL	RCV
0721					35,2733			VSR*	
0722					35,2734			0,2	
0723	REP	4	LAST	285	35,2735			STCALL	VCV
0724	REP	1			35,2736			INTEGRVS	
0725					35,2737		VLOAD	GOTO	
0726	REP	4	LAST	469	35,2740			RATT	
0727	REP	3	LAST	471	35,2741			RTRN	



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P0728 S34/35.5
R0729 SUBROUTINES USED

R0730 BANKCALL
R0731 GOFLASH
R0732 GOTOPOOH
R0733 S34/35.3
R0734 S34/35.4
R0735 VNPOOH

0736				35,2742	43020 1	S34/35.5 STO	BON
0737	REF	8	LAST	466	35,2743	02370 1	SUREXIT
0738	REF	1			35,2744	01311 0	FINVPLG
0739	REF	1			35,2745	72751 1	FLAGON
0740					35,2746	52014 0	
0741	REF	2	LAST	253	35,2747	00470 1	SET GOTO
0742	REF	1			35,2750	72775 1	UPDATEPLG
0743					35,2751	77414 0	FLAGOFF
0744	REF	1			35,2752	03274 0	FLAGON CLEAR EXIT
0745	REF	1			35,2753	3 3131 1	NTARGETPLG
0746	REF	66	LAST	456	35,2754	0 4555 0	CAP VOGN81
0747	REF	11	LAST	456	35,2755	20624 0	TC BANKCALL
0748	REF	8	LAST	456	35,2756	0 4108 1	CADR GOFLASH
0749					35,2757	0 2764 0	TC GOTOPOOH
0750	REF	44	LAST	460	35,2760	0 6006 1	TC +5
0751					35,2761	77414 0	TC INTERPRET
0752	REF	2	LAST	472	35,2762	03074 1	SET EXIT
0753	REF	2	LAST	472	35,2763	0 2753 1	NTARGETPLG
0754	REF	45	LAST	472	35,2764	0 6006 1	TC FLAGON +2
0755					35,2765	45014 0	TC INTERPRET
0756	REF	3	LAST	472	35,2766	03354 0	BOFF CALL
0757	REF	1			35,2767	72771 0	NTARGETPLG
0758	REF	1			35,2770	72817 1	NOCHG
0759					35,2771	77214 0	NOCHG CLEAR
0760	REF	1			35,2772	01287 0	
0761	REF	8	LAST	469	35,2773	03646 0	
0762	REF	3	LAST	121	35,2774	03646 0	STORE
0763					35,2775	77624 1	FLAGOFF CALL
0764	REF	1			35,2776	72662 0	
0765					35,2777	77776 1	S34/35.4
0766	REF	1			35,3000	3 3130 0	EXIT
0767	REF	4	LAST	457	35,3001	0 3114 0	CAP VOGN59
0768	REF	46	LAST	472	35,3002	0 6006 1	TC VNPOOH
0769					35,3003	77650 1	TC INTERPRET
0770	REF	9	LAST	472	35,3004	02370 1	GOTO SUREXIT



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E4 83

P0771 VN1645

R0772 SUBROUTINES USED

R0773 P3XORPTX
R0774 GET+MGA
R0775 BANKCALL
R0776 DELAYJOB
R0777 COMPTGO
R0778 GOFLASHR
R0779 GOTOPOCH
R0780 FLAGUP

0781				35,3005	71220 1	VN1645	STO	DLOAD	
0782	REF	10	LAST	472	35,3006	02370 1		SUBEXIT	
0783	REF	1			35,3007	33145 1		DP-.01	
0784	REF	4	LAST	274	35,3010	03626 0	STORE	+MGA	MGA = -.01
0785					35,3011	71214 0	BOFF	DLOAD	
0786	REF	2	LAST	472	35,3012	01351 1		FINALPLG	
0787	REF	1			35,3013	73033 0		GET45	
0788	REF	2	LAST	473	35,3014	33145 1		DP-.01	
0789					35,3015	77615 0	DAD		
0790	REF	3	LAST	473	35,3016	33145 1		DP-.01	
0791	REF	5	LAST	473	35,3017	03626 0	STORE	+MGA	MGA = -.02
0792					35,3020	77414 0	BOFF	EXIT	
0793	REF	1			35,3021	01742 1		REFSMPLG	
0794	REF	2	LAST	473	35,3022	73033 0		GET45	
0795	REF	1			35,3023	0 3106 0	TC	P3XORPTX	
0796					35,3024	0 3026 0	TC	+2	P3X
0797	REF	3	LAST	473	35,3025	0 3034 0	TC	GET45 +1	P7X
0798	REF	47	LAST	472	35,3026	0 6006 1	TC	INTPRET	
0799					35,3027	41575 0	VLOAD	PUSH	
0800	REF	4	LAST	472	35,3030	03646 0		DELVSIN	
0801					35,3031	77624 1	CALL		COMPUTE MGA
0802	REF	1			35,3032	10660 0		GET+MGA	
0803					35,3033	77776 1	GET45	EXIT	
0804	REF	1			35,3034	0 3564 0	TC	COMPTGO	INITIATE TASK TO UPDATE TLOG
0805	REF	11	LAST	473	35,3035	3 1770 0	CA	SUBEXIT	
0806	REF	2	LAST	90	35,3036	55*766 0	TS	QSAVED	
0807	REF	2	LAST	424	35,3037	3 4734 0	CAP	1SEC	
0808	REF	89	LAST	472	35,3040	0 4555 0	TC	BANKCALL	
0809	REF	2	LAST	194	35,3041	01732 0	CADR	DELAYJOB	
0810	REF	1			35,3042	3 3132 1	CAP	V16N45	TRONKNT, TLOG, +MGA
0811	REF	90	LAST	473	35,3043	0 4555 0	TC	BANKCALL	
0812	REF	12	LAST	472	35,3044	20624 0	CADR	GOFLASH	
0813	REF	1			35,3045	0 3050 1	TC	KILCLOCK	TERMINATE
0814	REF	1			35,3046	0 3053 1	TC	N45PROC	PROCEED
0815	REF	1			35,3047	0 3063 1	TC	CLUPDATE	RECYCLE - RETURN FOR INITIAL COMPUTATION
0816	REF	13	LAST	342	35,3050	3 0005 1	KILCLOCK	CA	Z
0817	REF	1			35,3051	54 000 0	TS	DISPDEX	



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0818	REF	9	LAST	472	35,3052	0	4108	1	TC	GOTOPOOH
0819	REF	7	LAST	299	35,3053	4	0076	1	N45PROC Cs	FLAGWRD2
0820	REF	30	LAST	383	35,3054	7	4705	0	MASK	BITS
0821					35,3055	0	0008	1	EXTEND	
0822	REF	2	LAST	473	35,3056	1	3050	0	B7P	KILCLOCK
0823	REF	20	LAST	447	35,3057	0	5301	0	TC	PHASCHNG
0824					35,3060	04024	0		OCT	04024
0825	REF	16	LAST	391	35,3061	0	5435	0	TC	UPFLAG
0826	REF	3	LAST	473	35,3062	00047	1		ADRES	FINALPLG
0827	REF	14	LAST	473	35,3063	3	0005	1	CLUPDATE CA	Z
0828	REF	2	LAST	473	35,3064	54	000	0	TS	DISPOEX
0829	REF	21	LAST	474	35,3065	0	5301	0	TC	PHASCHNG
0830					35,3066	04024	0		OCT	04024
0831	REF	48	LAST	473	35,3067	0	6008	1	TC	INTPRET
0832					35,3070	52014	0		CLEAR	GOTO
0833	REF	3	LAST	472	35,3071	00870	0			UPDATPLG
0834	REF	3	LAST	473	35,3072	02368	0			OSAVED

FINALPLG IS SET-FLASH V37-AWAIT NEW PQM

SET
FINALPLG

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P0835 DISPLAYE

R0836 SUBROUTINES USED

R0837 BANKCALL
 R0838 GOFLASHR
 R0839 GOTOPOOH
 R0840 BLANKET
 R0841 ENDOPJOB

0842				35,3073	0 0008 1	DISPLAYE-EXTEND	
0843	REF	9	LAST 470	35,3074	23-340 1	QXCH	NORMEX
0844	REF	1		35,3075	3 3128 1	CAP	V06N55
0845	REF	91	LAST 473	35,3076	0 4555 0	TCR	BANKCALL
0846	REF	1		35,3077	20763 1	CADR	GOFLASHR
0847	REF	10	LAST 474	35,3100	1 4106 0	TCF	GOTOPOOH
0848	REF	10	LAST 475	35,3101	0 1340 1	TC	NORMEX
0849				35,3102	1 3075 1	TCF	-5
0850	REF	35	LAST 442	35,3103	3 4712 1	CAP	BIT1
0851	REF	1		35,3104	0 5415 1	TCR	BLANKET
0852	REF	58	LAST 444	35,3105	1 5112 1	TCF	ENDOPJOB

BLANK R1



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P0853 P3XORP7X'

0854	REF	1		35,3106	3 7713 0	P3XORP7X	CAP	HIGH9
0855	REF	8	LAST	385	35,3107	7 1011 1	MASK	MODREG
0856					35,3110	0 0008 1	EXTEND	
0857					35,3111	1 3113 0	BZP	+2
0858	REF	151	LAST	439	35,3112	24 002 0	INCR	0
0859					35,3113	0 0002 0	RETURN	

R0860 VNPOCH

R0881 SUBROUTINES USED

R0882 BANKCALL
R0883 GOFLASH
R0884 GOTOPOCH

0885					35,3114	0 0008 1	VNPOCH	EXTEND
0886	REF	4	LAST	471	35,3115	23=787 0	QXCH	RTRN
0887	REF	2	LAST	89	35,3118	55=765 0	TS	VERBNOUN
0888	REF	3	LAST	478	35,3117	3 1785 1	CA	VERBNOUN
0889	REF	92	LAST	475	35,3120	0 4555 0	TCR	BANKCALL
0870	REF	13	LAST	473	35,3121	20824 0	CADR	GOFLASH
0871	REF	11	LAST	475	35,3122	1 4108 0	TCP	GOTOPOCH
0872	REF	5	LAST	478	35,3123	0 1787 0	TC	RTRN
0873					35,3124	1 3117 1	TCP	-5



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P0874 CONSTANTS

0875	35,3125	01445 0	V08N37	VN	0837
0876	35,3126	01487 0	V08N55	VN	0855
0877	35,3127	01472 1	V08N58	VN	0858
0878	35,3130	01473 0	V08N59	VN	0859
0879	35,3131	01521 0	V08N81	VN	0881
0880	35,3132	04055 0	V16N45	VN	1845
0881	35,3133	14441 0	TWOPI	2DEC	6.283185307 B-4
0881	35,3134	37325 1			
0882	35,3135	00001 0	MAX250	2DEC	25 E3
0882	35,3136	20850 0			
0883	35,3137	12525 0	THIRD	2DEC	.333333333
0883	35,3140	12525 0			
0884	35,3141	00004 0	ELEPS	2DEC	.27777777 E-3
0884	35,3142	21505 1			
0885	35,3143	00002 0	DECTWO	OCT	2
0886	35,3144	77777 0	DP-.01	OCT	77777
0887	35,3145	81337 1		OCT	81337
08871	35,3146	01252 0	EPSPOUR	2DEC	.0416666666
08871	35,3147	25253 1			

CONSTANTS
ADJACENT

-.01 FOR MGA DSP

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P0888 INITVEL

R0889 MOD NO -1 LOG SECTION - P34-P35, P74-P75
R0890 MOD BY WHITE,P DATE 21NOV67

R0891 FUNCTIONAL DESCRIPTION

R0892 THIS SUBROUTINE COMPUTES THE REQUIRED INITIAL VELOCITY VECTOR FOR
R0893 A TRAJECTORY OF SPECIFIED TRANSFER TIME BETWEEN SPECIFIED INITIAL
R0894 AND TARGET POSITIONS. THE TRAJECTORY MAY BE EITHER CONIC OR
R0895 PRECISION DEPENDING ON AN INPUT PARAMETER (NAMELY, NUMBER OF
R0896 OFFSETS). IN ADDITION, IN THE PRECISION TRAJECTORY CASE, THE
R0897 SUBROUTINE ALSO COMPUTES AN OFFSET TARGET VECTOR, TO BE USED
R0898 DURING PURE-CONIC CROSS-PRODUCT STEERING. THE OFFSET TARGET
R0899 VECTOR IS THE TERMINAL POSITION VECTOR OF A CONIC TRAJECTORY WHICH
R0900 HAS THE SAME INITIAL STATE AS A PRECISION TRAJECTORY WHOSE
R0901 TERMINAL POSITION VECTOR IS THE SPECIFIED TARGET VECTOR.

R0902 IN ORDER TO AVOID THE INHERENT SINGULARITIES IN THE 180 DEGREE
R0903 TRANSFER CASE WHEN THE (TRUE OR OFFSET) TARGET VECTOR MAY BE
R0904 SLIGHTLY OUT OF THE ORBITAL PLANE, THIS SUBROUTINE ROTATES THIS
R0905 VECTOR INTO A PLANE DEFINED BY THE INPUT INITIAL POSITION VECTOR
R0906 AND ANOTHER INPUT VECTOR (USUALLY THE INITIAL VELOCITY VECTOR),
R0907 WHENEVER THE INPUT TARGET VECTOR LIES INSIDE A CONE WHOSE VERTEX
R0908 IS THE ORIGIN OF COORDINATES, WHOSE AXIS IS THE 180 DEGREE
R0909 TRANSFER DIRECTION, AND WHOSE CONE ANGLE IS SPECIFIED BY THE USER.

R0910 THE LAMBERT SUBROUTINE IS UTILIZED FOR THE CONIC COMPUTATIONS AND
R0911 THE COASTING INTEGRATION SUBROUTINE IS UTILIZED FOR THE PRECISION
R0912 TRAJECTORY COMPUTATIONS.

R0913 CALLING SEQUENCE

R0914 L CALL
R0915 L+1 INITVEL
R0916 L+2 (RETURN - ALWAYS)

R0917 INPUT

R0918 (1) RINIT INITIAL POSITION RADIUS VECTOR
R0919 (2) VINIT INITIAL POSITION VELOCITY VECTOR
R0920 (3) RTARG TARGET POSITION RADIUS VECTOR
R0921 (4) DELT4 DESIRED TIME OF FLIGHT FROM RINIT TO RTARG
R0922 (5) INTIME TIME OF RINIT
R0923 (6) 0D NUMBER OF ITERATIONS OF LAMBERT/INTEGRVS
R0924 (7) 2D ANGLE TO 180 DEGREES WHEN ROTATION STARTS
R0925 (8) RTX1 -2 FOR EARTH, -10D FOR LUNAR
R0925 (9) RTX2 COORDINATE SYSTEM ORIGIN - 0 FOR EARTH, 2 FOR LUNAR
R0926 PUSHLOC SET AT 4D



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R0927 OUTPUT

R0928 (1) RTARG OFFSET TARGET POSITION VECTOR
R0929 (2) VIPRME MANEUVER VELOCITY REQUIRED
R0930 (3) VIPRME VELOCITY AT TARGET AFTER MANEUVER
R0931 (4) DELVEET3 DELTA VELOCITY REQUIRED FOR MANEUVER

R0932 SUBROUTINES USED

R0933 LAMBERT
R0934 INTSTALL
R0935 INTERVRS

0936 REF 1 11,2000 SETLOC INTVEL
0937 11,2000 BANK

0938 REF 1 COUNT 11/INITV

0958 11,2000 77614 1 INITVEL SET
0959 REF 1 11,2001 00475 1 GUESSW
0960 11,2002 44175 1 HAVEQUES VLOAD STO
0961 REF 7 LAST 469 11,2003 03415 1 RTARG
0962 REF 11 LAST 475 11,2004 01340 1 NORMEX
0963 REF 2 LAST 120 11,2005 03604 0 STORE RTARG1
0964 11,2006 46135 1 SLOAD RHIZ
0965 REF 3 LAST 471 11,2007 03747 0 RTX2
0967 REF 1 11,2010 22022 1 INITVEL1
0968 11,2011 72575 0 VLOAD VSL2
0969 REF 4 LAST 467 11,2012 03570 0 RINIT
0970 REF 5 LAST 479 11,2013 27570 0 STOVL RINIT
0971 REF 4 LAST 467 11,2014 03576 0 VINIT
0972 11,2015 77752 1 VSL2
0973 REF 5 LAST 479 11,2016 27576 0 STOVL VINIT
0974 REF 3 LAST 479 11,2017 03604 0 RTARG1
0975 11,2020 77752 1 VSL2
0976 REF 4 LAST 479 11,2021 03604 0 STORE RTARG1
R0977 INITIALIZATION

COGA GUESS NOT AVAILABLE

B29

B27

B7

B5

0976 11,2022 71331 0 INITVEL1 SSP DLOAD SET ITCTR TO -1, LOAD MPAC WITH E4(PL 2D)
0979 REF 1 11,2023 03505 1 ITCTR
0980 11,2024 77776 1 0 -1
0981 11,2025 70546 1 COSINE SR1 CALCULATE COSINE (E4) (+2)
0982 REF 2 LAST 121 11,2026 17630 1 STODL COZY4 SET COZY4 TO COSINE(E4) (PL 0D)
0983 11,2027 67154 0 LXA,2 SXA,2
0984 REF 236 LAST 462 11,2030 00154 1 MPAC
0985 REF 2 LAST 94 11,2031 02703 1 VTARGETAG SET VTARGETAG TO 0D (SP)
0986 11,2032 77775 1 VLOAD
0987 REF 6 LAST 479 11,2033 03570 0 RINIT
0988 REF 3 LAST 94 11,2034 26657 1 STOVL R1VEC
0989 REF 5 LAST 479 11,2035 03604 0 RTARG1 R1VEC EQ RINIT



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0990	REF	2	LAST	94	11,2038	18885 0	STOVL	R2VEC	R2VEC EQ RTARG	
0991	REF	5	LAST	487	11,2037	03423 1		DELLT4		
0992	REF	2	LAST	94	11,2040	02873 1	STORE	TDESIRE	TDESIRE EQ DELLT4	
0993					11,2041	77201 1	SETPD	VLOAD		
0994					11,2042	00001 0		QD	INITIALIZE PL TO QD	
0995	REF	7	LAST	479	11,2043	03570 0		RINIT	MPAC EQ RINIT (+29)	
0996					11,2044	41458 0	UNIT	PUSH	UNIT(RI) (+1)	(PL 8D)
0997					11,2045	53435 0	VXV	UNIT		
0998	REF	6	LAST	479	11,2046	03576 0		VINIT	MPAC EQ UNIT(RI) X VI (+8)	
0999	REF	2	LAST	94	11,2047	26878 1	STOVL	UN		
1000	REF	6	LAST	479	11,2050	03804 0		RTARG1		
1001					11,2051	50258 0	UNIT	DOT	TEMP=URT.URI (+2)	(PL 0D)
1002					11,2052	43015 1	DAD	CLEAR		
1003	REF	3	LAST	479	11,2053	03630 1		COZY4		
1004	REF	1			11,2054	03885 1		NORMSW		
1005	REF	4	LAST	480	11,2055	03830 1	STORE	COZY4		
1006					11,2056	43044 0	INITVEL2	RPL	SET	
1007	REF	1			11,2057	22101 1		INITVEL3	UN CALCULATED IN LAMBERT	
1008	REF	2	LAST	480	11,2080	03485 0		NORMSW		
R1009	ROTATE RC INTO YC PLANE - SET UNIT NORMAL TO YC									
1010					11,2081	41575 0	VLOAD	PUSH		(PL 8D)
1011	REF	3	LAST	480	11,2082	02885 0		R2VEC	RC TO 8D (+29)	
1012					11,2083	83246 1	ABVAL	PDVL	RC TO MPAC, ABVAL(RC) (+29) TO QD(PL 2D)	(PL 8D)
1013					11,2084	48208 1	PUSH	VPROJ		
1014	REF	3	LAST	480	11,2085	02678 1		UN		
1015					11,2086	51352 1	VSL2	BVSU		
1016					11,2087	74256 0	UNIT	VXSC		(PL 0D)
1017					11,2070	77772 0	VSL1			
1018	REF	4	LAST	480	11,2071	02665 0	STORE	R2VEC		
1019					11,2072	67351 1	TLOAD	SLOAD		
1020	REF	2	LAST	31	11,2073	11456 0		ZEROVEC		
1021	REF	2	LAST	479	11,2074	03505 1		ITCTR		
1022					11,2075	77244 0	RPL	VLOAD		
1023	REF	2	LAST	480	11,2076	22101 1		INITVEL3		
1024	REF	5	LAST	480	11,2077	02885 0		R2VEC		
1025	REF	7	LAST	480	11,2100	03604 0	STORE	RTARG1		
1026					11,2101	63345 0	INITVEL3	DLOAD		(PL 2D)
1027	REF	1			11,2102	27736 0		MUEARTH	POSITIVE VALUE	
1028	REF	6	LAST	480	11,2103	02665 0		R2VEC		
102802					11,2104	63256 0	UNIT	PDVL	2D = UNIT(R2VEC)	(PL 8D)
102804	REF	4	LAST	479	11,2105	02857 1		R1VEC		
102806					11,2106	41458 0	UNIT	PUSH	8D = UNIT(R1VEC)	(PL 14D)
102808					11,2107	57435 1	VXV	VCOMP	-N = UNIT(R2VEC) X UNIT(R1VEC)	
10281					11,2110	00003 1		2D		
10282					11,2111	77806 1	PUSH			(PL 20D)
10283					11,2112	71350 1	LXA,1	DLOAD		
10284	REF	3	LAST	456	11,2113	03745 1		RTX1		
10285					11,2114	00023 0		18D		
10288					11,2115	82040 1	RAN	INCR,1		



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10287		11,2116	22120 1		+2	
10288		11,2117	77767 1	DEC	-8	
10289		11,2120	67310 1	INCR,1	SLOAD	
1029		11,2121	00012 1		10D	
10291	REF 4 LAST 483	11,2122	00047 1		X1	
10292		11,2123	77230 0	BHIZ	VLOAD	(PL14D)
10293		11,2124	22128 1		+2	
10294		11,2125	41476 1	VCOMP	PUSH	(PL20D)
10295		11,2126	77775 1	VLOAD		(PL14D)
10296		11,2127	50235 0	VXV	DOT	(PL 2D)
1032		11,2130	71244 0	BPL	DLOAD	(PL 0D)
1033	REF 1	11,2131	22133 0		INITVEL4	
1034		11,2132	41476 1	DCOMP	PUSH	(PL 2D)
1035		11,2133	67154 0	INITVEL4 LXA,2	SXA,2	
1036		11,2134	00000 1		0D	
1037	REF 2 LAST 94	11,2135	02674 0		GEOMSCN	
R1038	SET INPUTS UP FOR LAMBERT					
1039		11,2136	45150 1	LXA,1	CALL	
1040	REF 4 LAST 480	11,2137	03745 1		RTX1	
R1041	OPERATE THE LAMBERT CONIC ROUTINE (COASTFLT SUBROUTINE)					
1042	REF 1	11,2140	25215 0		LAMBERT	
R1043	DELETE THRU 4521					
R1044	ARRIVED AT SOLUTION IS GOOD ENOUGH ACCORDING TO SLIGHTLY WIDER BOUNDS.					
1045		11,2141	77214 0	CLEAR	VLOAD	
1046	REF 2. LAST 479	11,2142	00675 0		QUESSW	
1047	REF 3 LAST 456	11,2143	02746 0		WVEC	
R1048	STORE CALCULATED INITIAL VELOCITY REQUIRED IN VIPRIME					
R1049						
1050	REF 4 LAST 457	11,2144	17612 1	STOOL	VIPRIME	INITIAL VELOCITY REQUIRED (+7)
R1051						
R1052	IF NUMIT IS ZERO, CONTINUE AT INITVELB, OTHERWISE					
R1053	SET UP INPUTS FOR ENCKE INTEGRATION (INTEGRVS).					
1054	REF 3 LAST 479	11,2145	02704 0		VTARGETAG	
1055		11,2146	45030 0	BHIZ	CALL	
1056	REF 1	11,2147	22224 0		INITVEL7	
1057	REF 7 LAST 471	11,2150	27371 1		INTSTALL	
1061		11,2151	43135 1	SLOAD	CLEAR	
1062	REF 4 LAST 479	11,2152	03747 0		RTX2	
1063	REF 3 LAST 471	11,2153	00263 0		MOONFLAG	
1064		11,2154	43030 0	BHIZ	SET	
1065	REF 1	11,2155	22157 1		INITVEL5	
1066	REF 4 LAST 481	11,2156	00063 1		MOONFLAG	
1067		11,2157	77775 1	INITVEL5	VLOAD	
1068	REF 8 LAST 480	11,2160	03570 0		RINIT	
1069	REF 5 LAST 480	11,2161	02657 1	STORE	R1VEC	



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1070	REP	5	LAST	471	11,2162	25535 0	STOVL	RCV		
1071	REP	5	LAST	461	11,2163	03612 1		VIPRIME		
1072	REP	5	LAST	471	11,2164	15543 1	STOOL	VCV		
1073	REP	6	LAST	487	11,2165	03503 1		INTIME		
1074	REP	5	LAST	471	11,2166	01517 0	STORE	TET		
1075					11,2167	43015 1	DAD	CLEAR		
1076	REP	6	LAST	460	11,2170	03423 1		DELLT4		
1077	REP	3	LAST	471	11,2171	01673 1		INTYPFLG		
1078	REP	7	LAST	471	11,2172	34041 0	STCALL	TDEC1		
1079	REP	2	LAST	471	11,2173	27066 1		INTEGRVS		
1080					11,2174	77775 1	VLOAD			
1081	REP	1			11,2175	00025 0		VATT1		
1082	REP	2	LAST	94	11,2176	02705 1	STORE	VTARGET		
R1083	IF ITERATION COUNTER (ITCTR) EQ NO. ITERATIONS (NUMIT), CONTINUE AT									
R1084	INITVELC, OTHERWISE REITERATE LAMBERT AND ENCKE									
1085					11,2177	63154 1	LXA,2	INCR,2		
1086	REP	3	LAST	460	11,2200	03504 0		ITCTR		
1087					11,2201	00001 0		ID		INCREMENT ITCTR
1088					11,2202	55134 1	SXA,2	XSU,2		
1089	REP	4	LAST	462	11,2203	03504 0		ITCTR		
1090	REP	4	LAST	461	11,2204	02703 1		VTARGET		
1091					11,2205	46135 1	SLOAD	BHIZ		IF SP(MPAC) EQ 0, CONTINUE AT INITVELC
1092	REP	2	LAST	450	11,2206	00050 1		X2		
1093	REP	1			11,2207	22221 0		INITVEL6		
R1094										
R1095	OFFSET CONIC TARGET VECTOR									
1096					11,2210	52375 1	VLOAD	VSU		
1097	REP	8	LAST	460	11,2211	03604 0		RTARG1		
1098	REP	1			11,2212	00017 1		RATT1		
1099					11,2213	77655 1	VAD			
1100	REP	7	LAST	460	11,2214	02665 0		R2VEC		
1101	REP	6	LAST	462	11,2215	16665 0	STOOL	R2VEC		
1102	REP	5	LAST	460	11,2216	03630 1		COZY4		
1103					11,2217	77650 1	GOTO			
1104	REP	1			11,2220	22056 1		INITVEL2		CONTINUE ITERATING AT INITVEL2
R1105	COMPUTE THE DELTA VELOCITY									
1106					11,2221	77775 1	INITVEL6	VLOAD		
1107	REP	9	LAST	462	11,2222	02665 0		R2VEC		
1108	REP	9	LAST	462	11,2223	03604 0	STORE	RTARG1		
1109					11,2224	52375 1	INITVEL7	VLOAD		
1110	REP	6	LAST	462	11,2225	03612 1		VSU		
1111	REP	7	LAST	480	11,2226	03576 0		VIPRIME		
1112	REP	9	LAST	472	11,2227	27646 0		VINIT		
1113	REP	3	LAST	462	11,2230	02705 1	STOVL	DELVEET3		DELVEET3 = VIPRIME-VINIT (+7)
1114	REP	4	LAST	457	11,2231	03620 0		VTARGET		
1115					11,2232	46135 1	STORE	VTPRIME		
1116	REP	5	LAST	481	11,2233	03747 0	SLOAD	BHIZ		
								RTX2		



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1117	REP	1		11,2234	22251 1		INITVELX
11171				11,2235	70575 1	VLOAD	VSR2
11172	REP	5	LAST 482	11,2238	03820 0		VTPRIME
1118	REP	6	LAST 483	11,2237	27820 0	STOVL	VTPRIME
1119	REP	7	LAST 482	11,2240	03812 1		VIPRIME
1120				11,2241	77742 0	VSR2	
1121	REP	8	LAST 483	11,2242	27812 1	STOVL	VIPRIME
1122	REP	10	LAST 482	11,2243	03804 0		RTARG1
1123				11,2244	77742 0	VSR2	
1124	REP	11	LAST 483	11,2245	27804 0	STOVL	RTARG1
1125	REP	10	LAST 482	11,2248	03848 0		DELVEET3
1126				11,2247	77742 0	VSR2	
1127	REP	11	LAST 483	11,2250	03848 0	STORE	DELVEET3
1128				11,2251	77201 1	INITVELX SETPD	VLOAD
1129				11,2252	00001 0		OD
1130	REP	12	LAST 483	11,2253	03804 0		RTARG1
1131	REP	8	LAST 479	11,2254	37415 0	STCALL	RTARG
1134	REP	12	LAST 479	11,2255	01340 1		NORMEX
R1135							
R1136							

..... END OF INITVEL ROUTINE



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P1137 MIDGIM

R1138 MOD NO. 0, BY WILLMAN, SUBROUTINE RENDQUID, LOG P34-P35, P74-P75
R1139 REVISION 03, 17 FEB 67

R1140 IF THE ACTIVE VEHICLE IS DOING THE COMPUTATION, MIDGIM COMPUTES
R1141 THE POSITIVE MIDDLE GIMBAL ANGLE OF THE ACTIVE VEHICLE TO THE INPUT
R1142 DELTA VELOCITY VECTOR (QD IN PUSH LIST), OTHERWISE
R1143 MIDGIM CONVERTS THE INPUT DELTA VELOCITY VECTOR FROM INERTIAL COORDIN-
R1144 ATES TO LOCAL VERTICAL COORDINATES OF THE ACTIVE VEHICLE.

R1145 .. INPUTS ..

R1146	NAME	MEANING	UNITS/SCALING/MODE
R1147	AVFLAG	INT FLAG - 0 IS CSM ACTIVE, 1 IS LEM ACTIVE	BIT
R1148	COMPUTER	INT FLAG - 0 IS LEM COMPUTER, 1 IS CSM COMPUTER	BIT
R1149	RINIT	ACTIVE VEHICLE RADIUS VECTOR	METERS/CSEC (+7) VT
R1150	VINIT	ACTIVE VEHICLE VELOCITY VECTOR	METERS/CSEC (+7) VT
R1151	QD (PL)	ACTIVE VEHICLE DELTA VELOCITY VECTOR	METERS/CSEC (+7) VT

R1152 .. OUTPUTS ..

R1153	NAME	MEANING	UNITS/SCALING/MODE
R1154	+MGA	+ MIDDLE GIMBAL ANGLE	REVOLUTIONS (+0) DP
R1155	DELVLVC	DELTA VELOCITY VECTOR IN LV COORD.	METERS/CSEC (+7) VT
R1156	MGLVFLAG	INT FLAG - 0 IS +MGA COMPUTED, 1 IS DELVLVC COMP.	BIT

R1157 .. CALLING SEQUENCE ..

R1158 L CALL
R1159 L+1 MIDGIM
R1160 L+2 (RETURN - ALWAYS)

R1161 .. NO SUBROUTINES CALLED ..

R1162 .. DEBRIS - ERASEABLE TEMPORARY USAGE

R1163 A, O, L, PUSH LIST, MPAC.

R1164 .. ALARMS - NONE ..



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P1165 MIDDLE GIMBAL ANGLE COMPUTATION.

1166	REP	1		04,2000		SETLOC MIDDGIM	
1167				04,2651		BANK	
1168	REP	1				COUNT* \$S/MIDG	
1169				04,2651	20000 0	HALPREV	2DEC 1 B-1
1169				04,2652	00000 1		
1170				04,2653	43014 0	MIDGIM	BCN BOPF
1171	REP	1		04,2654	01312 0		AVFLAG
1172	REP	1		04,2655	10873 1		MIDGIM1
1173	REP	1		04,2656	02747 1		COMPUTER
1174	REP	1		04,2657	10876 1		GET.LVC
R1175	COMPUTE +MGA IF AVFLAG AND COMPUTER HAVE OPPOSITE VALUES.						
1176				04,2660	53575 0	GET+MGA	VLOAD UNIT
1177				04,2661	72441 0	DOT	SL1
1178	REP	3	LAST 169	04,2662	01744 1		REPSMMAT +6
1179				04,2663	51136 1	ARCSIN	BPL
1180	REP	1		04,2664	10870 1		SETMGA
1181				04,2665	43215 0	DAD	DAD
1182	REP	1		04,2666	10852 1	HALPREV	
1183	REP	2	LAST 465	04,2667	10852 1	HALPREV	
1184	REP	6	LAST 473	04,2670	03626 0	SETMGA	STORE +MGA
1185				04,2671	43414 1	CLR	RVO
1186	REP	1		04,2672	02675 1		MGLVFLAG
1187				04,2673	77614 1	MIDGIM1	BOPF
1188	REP	2	LAST 485	04,2674	02747 1		COMPUTER
1189	REP	2	LAST 473	04,2675	10860 0		GET+MGA
R1190	COMPUTE DELVLVC IF AVFLAG AND COMPUTER HAVE SAME VALUES.						
1191				04,2676	53575 0	GET.LVC	VLOAD UNIT
1192	REP	9	LAST 461	04,2677	03570 0		RINIT
1193				04,2700	77676 0	VCOMP	
1194				04,2701	00023 0	STORE	18D
1195				04,2702	53435 0	VXV	UNIT
1196	REP	8	LAST 462	04,2703	03576 0		VINIT
1197				04,2704	00015 0	STORE	12D
1198				04,2705	53435 0	VXV	UNIT
1199				04,2706	00023 0		18D
1200				04,2707	24007 0	STOVL	6D
1201				04,2710	00001 0		6D
1202				04,2711	76521 0	MXV	VSL1
1203				04,2712	00007 0		6D
1204	REP	9	LAST 469	04,2713	03405 0	STORE	DELVLVC
1205				04,2714	43414 1	SET	RVO
1206	REP	2	LAST 465	04,2715	02475 0		MGLVFLAG
R1207	..... END OF MIDGIM ROUTINE						

(PL 6D) V (+7) TO MPAC, UNITIZE UV (+1)
DOT UV WITH Y(STABLE MEMBER) AND RESCALE
FROM +2 TO +1 FOR ASIN ROUTINE

CONVERT -MGA TO +MGA BY
ADDING ONE REVOLUTION

CLEAR MGLVFLAG TO INDICATE +MGA CALC
AND EXIT

(PL 6D) R (+29) IN MPAC, UNITIZE UR

U(-R)
U(-R) TO 18D
U(-R)*V EQ V*U(R), U(V*R)
U(V*R) TO 12D
U(V*R)*U(-R), U(V*R)*(-R))

TRANSFORMATION MATRIX IS IN 6D (+1)
DELTA V (+7) IN 6D
CONVERT FROM INER COOR TO LV COOR (+6)
AND SCALE +7 IN MPAC
STORE IN DELVLVC (+7)
SET MGLVFLAG TO INDICATE LVC CALC
AND EXIT



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P1206
1209          04,2716 77160 0 SELECTMU AXG,1 AXT,2
1210          04,2717 00002 0                2D
1211          04,2720 00000 1                0D
1212          04,2721 77614 1                BOFF
1213 REP      3 LAST 471 04,2722 04343 1                CMOONPLG
1214 REP      1          04,2723 10727 1                SETMUER
1215          04,2724 77160 0                AXG,1 AXT,2
1216          04,2725 00012 1                10D
1217          04,2726 00002 0                2D
1218          04,2727 66143 1 SETMUER DLOAD* SXA,1
1219 REP      1          04,2730 11635 1                MUTABLE +4,1
1220 REP      5 LAST 461 04,2731 03745 1                RTX1
1221 REP      2 LAST 124 04,2732 23752 0                STODL* RTSR1/MU
1222 REP      2 LAST 486 04,2733 11627 1                MUTABLE -2,1
1223          04,2734 54214 1                BOFF SR
1224 REP      4 LAST 466 04,2735 04343 1                CMOONPLG
1225 REP      1          04,2736 10740 0                RTRMU
1226          04,2737 20607 1                6D
1227 REP      2 LAST 124 04,2740 03750 0 RTRMU STORE RTMU
1228          04,2741 43134 0                SXA,2 CLEAR
1229 REP      6 LAST 462 04,2742 03746 1                RTX2
1230 REP      4 LAST 474 04,2743 01271 1                FINALPLG
1234          04,2744 77650 1                GOTO
1235 REP      3 LAST 460 04,2745 73005 0                VN1645
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P1236 PERIAPO

R1237 MOD NO -1 LOG SECTION - P34-P35, P74-P75

R1238 MOD BY WHITE.P DATE 18JAN68

R1239 FUNCTIONAL DESCRIPTION

R1240 THIS SUBROUTINE COMPUTES THE TWO BODY APOCENTER AND PERICENTER
R1241 ALTITUDES GIVEN THE POSITION AND VELOCITY VECTORS FOR A POINT ON
R1242 THE TRAJECTORY AND THE PRIMARY BODY.

R1243 SETRAD IS CALLED TO DETERMINE THE RADIUS OF THE PRIMARY BODY.

R1244 APSIDES IS CALLED TO SOLVE FOR THE TWO BODY RADII OF APOCENTER AND
R1245 PERICENTER AND THE ECCENTRICITY OF THE TRAJECTORY.

R1246 CALLING SEQUENCE

R1247 L CALL
R1248 L+1 PERIAPO
R1249 L+2 (RETURN - ALWAYS)

R1250 INPUT

R1251 (1) RVEC POSITION VECTOR IN METERS
R1252 SCALE FACTOR - EARTH +29, MOON +27
R1253 (2) VVEC VELOCITY VECTOR IN METERS/CENTISECOND
R1254 SCALE FACTOR - EARTH +7, MOON +5
R1255 (3) X1 PRIMARY BODY INDICATOR
R1256 EARTH -2, MOON -10

R1257 OUTPUT

R1258 (1) 2D APOCENTER RADIUS IN METERS
R1259 SCALE FACTOR - EARTH +29, MOON +27
R1260 (2) 4D APOCENTER ALTITUDE IN METERS
R1261 SCALE FACTOR - EARTH +29, MOON P27
R1262 (3) 6D PERICENTER RADIUS IN METERS
R1263 SCALE FACTOR - EARTH +29, MOON +27
R1264 (4) 8D PERICENTER ALTITUDE IN METERS
R1265 SCALE FACTOR - EARTH +29, MOON +27
R1266 (5) ECC ECCENTRICITY OF CONIC TRAJECTORY
R1267 SCALE FACTOR - +3
R1268 (6) XXXALT RADIUS OF THE PRIMARY BODY IN METERS
R1269 SCALE FACTOR - EARTH +29, MOON +27
R1270 (7) PUSHLOC EQUALS 10D

R1271 SUBROUTINES USED

R1272 SETRAD



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R1273 APSIDES

1274 REF 1 22,2000
1275 22,3310

SETLOC APOPERI
BANK

1278 REF 1

COUNT* \$\$/PERAP

1277 22,3310 00302 0 RPAD
1277 22,3311 17755 0
A1278

2DEC 6373338 B-29

STANDARD RADIUS OF PAD 37-B.

= 20 909 901.57 FT

1279 22,3312 53754 1 PERIAPO₁ LXA,2 VSR*
1280 REF 7 LAST 488 22,3313 03746 1 RTX2
1281 22,3314 57178 0 0,2
1282 REF 4 LAST 481 22,3315 28748 0 STOVL VVEC
1283 22,3318 53750 0 LXA,1 VSR*
1284 REF 6 LAST 486 22,3317 03745 1 RTX1
1285 22,3320 57178 0 0,2
1288 REF 2 LAST 458 22,3321 02857 1 STORE RVEC
1287 22,3322 45020 1 PERIAPO STO CALL
1288 REF 13 LAST 483 22,3323 01340 1 NORMEX
1289 REF 1 22,3324 45340 1 SETRAD
1290 REF 2 LAST 120 22,3325 37458 1 STCALL XXXALT
1291 REF 1 22,3326 25871 0 APSIDES
1292 22,3327 41401 1 SETPD PUSH
1293 22,3330 00003 1 2D
1294 22,3331 85225 1 DSU PDOL
1295 REF 3 LAST 488 22,3332 03456 0 XXXALT
1296 22,3333 00001 0 0D
1297 22,3334 45206 1 PUSH DSU
1298 REF 4 LAST 466 22,3335 03456 0 XXXALT
1299 22,3336 52006 0 PUSH GOTO
1300 REF 14 LAST 488 22,3337 01340 1 NORMEX

2D = APOCENTER RADIUS B29 OR B27

4D = APOGEE ALTITUDE B29 OR B27

8D = PERICENTER RADIUS B29 OR B27

8D = PERIGEE ALTITUDE B29 OR B27



L P34-P35, P74-P75

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P1301	SETRAD						
1302		22,3340	41545 0	SETRAD	DLOAD	PUSH	
1303	REF 1	22,3341	05311 1			RPAD	
1304		22,3342	63130 0		EXA,1	INCR,2	
1305	REF 3 LAST 482	22,3343	00047 1			X2	
1308		22,3344	00002 0			2D	
1307		22,3345	48135 1		SLOAD	PHIZ	
1308	REF 4 LAST 489	22,3348	00050 1			X2	
1309	REF 1	22,3347	45353 0			SETRADX	
1310		22,3350	51575 1		VLOAD	ABVAL	
1311	REF 2 LAST 175	22,3351	02028 1			RLS	
1312		22,3352	77725 1		POOL		
1313		22,3353	43545 1	SETRADX	DLOAD	RVO	

L P34-P35, P74-P75

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P1314	PRECSET								
1315				22,3354	77620 0	PRECSET	STQ		
1316	REF	15	LAST	466	22,3355	01340 1		NORMEX	
1317	REF	1			22,3356	36635 1	STCALL	TDEC2	
1318	REF	2	LAST	32	22,3357	27036 1		LEMPREC	
1319					22,3360	77624 1	CALL		
1320	REF	1			22,3361	45372 0		LEMSTORE	
1321					22,3362	77745 1	DLOAD		
1322	REF	2	LAST	490	22,3363	02635 0		TDEC2	
1323	REF	6	LAST	462	22,3364	34041 0	STCALL	TDEC1	
1324	REF	2	LAST	32	22,3365	27022 1		CSMPREC	
1325					22,3366	77624 1	CALL		
1326	REF	1			22,3367	45402 0		CSMSTORE	
1327					22,3370	77650 1	GOTO		
1328	REF	16	LAST	490	22,3371	01340 1		NORMEX	
1329					22,3372	43175 0	LEMSTORE	VLOAD	BOFF
1330	REF	5	LAST	471	22,3373	00001 0		RATT	
1331	REF	2	LAST	465	22,3374	01352 1		AVFLAG	
1332	REF	2	LAST	464	22,3375	45406 1		PASSIVE	
1333	REF	15	LAST	471	22,3376	27540 0	ACTIVE	STOVL	RACT3
1334	REF	2	LAST	467	22,3377	00007 0		VATT	
1335	REF	7	LAST	469	22,3400	03546 0		STORE	VACT3
1336					22,3401	77616 0		RVO	
1337					22,3402	43175 0	CSMSTORE	VLOAD	BOFF
1338	REF	6	LAST	490	22,3403	00001 0		RATT	
1339	REF	3	LAST	490	22,3404	01352 1		AVFLAG	
1340	REF	2	LAST	464	22,3405	45376 1		ACTIVE	
1341	REF	7	LAST	467	22,3406	27554 0	PASSIVE	STOVL	RPASS3
1342	REF	3	LAST	490	22,3407	00007 0		VATT	
1343	REF	7	LAST	467	22,3410	03562 0		STORE	VPASS3
1344					22,3411	77616 0		RVO	



L P34-P35, P74-P75

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P1345	VECSHIFT						
1346			22,3412	53754 1	VECSHIFT LXA,2	VSR*	
1347	REP 8 LAST 488		22,3413	03746 1		RTX2	
1348			22,3414	57176 0		0,2	
1349			22,3415	63350 1	LXA,1	PDVL	
1350	REP 7 LAST 488		22,3416	03745 1		RTX1	
1351			22,3417	63257 1	VSR*	PDVL	
1352			22,3420	57176 0		0,2	
1353			22,3421	77616 0	RVO		



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P1354	SHIPTR1						
1355		22,3422	53754 1	SHIPTR1	LXA,2	SL*	
1358	REF 9 LAST 491	22,3423	03748 1			RTX2	
1357		22,3424	57578 1			0,2	
1358		22,3425	77618 0		RVD		



L P34-P35, P74-P75

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P1359 PROGRAM DESCRIPTION

R1360 SUBROUTINE NAME R36 OUT-OF-PLANE RENDEZVOUS ROUTINE

R1361 MOD NO. 0 DATE 22 DECEMBER 67

R1362 MOD BY N.M. NEVILLE LOG SECTION EXTENDED VERBS

R1363 FUNCTIONAL DESCRIPTION

R1364 TO DISPLAY AT ASTRONAUT REQUEST LOC CALCULATED RENDEZVOUS

R1365 OUT-OF-PLANE PARAMETERS (Y, YDOT, PSI). (REQUESTED BY DSKY).

R1366 CALLING SEQUENCE

R1367 ASTRONAUT REQUEST THROUGH DSKY V 90 E

R1368 SUBROUTINES CALLED

R1369 EXDSPRET

R1370 COMARCP

R1371 CSMPREC

R1372 LEMPREC

R1373 SQNAGREE

R1374 LOADTIME

R1375 NORMAL EXIT MODES

R1376 ASTRONAUT REQUEST THROUGH DSKY TO TERMINATE PROGRAM V 34 E

R1377 ALARM OR ABORT EXIT MODES

R1378 NONE

R1379 OUTPUT

R1380 DECIMAL DISPLAY OF TIME, Y, YDOT AND PSI

R1381 DISPLAYED VALUES Y, YDOT, AND PSI, ARE STORED IN ERASABLE

R1382 REGISTERS RANGE, RRATE AND RTHETA RESPECTIVELY.

R1383 ERASABLE INITIALIZATION REQUIRED

R1364 CSM AND LEM STATE VECTORS

R1385 DEBRIS

R1366 CENTRALS A, Q, L

R1387 OTHER THOSE USED BY THE ABOVE LISTED SUBROUTINES

1386 20,2000

1389 REF 1 04,2000

1390 04,2746

BANK 20

SETLOC R36LM

BANK



L P34-P35, P74-P75

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1391	REF	3	LAST	280	E4,1726	EBANK= RPASS36
1392	REF	1				COUNT* \$\$/R36
1393					04,2748 22 007 0	R36 ZL
1394	REF	106	LAST	447	04,2747 3 4714 1	CAP ZERO
1395	REF	3	LAST	286	04,2750 53*052 0	DXCH DSPIEMX
1396	REF	1			04,2751 3 3101 1	CAP V08N16N
1397	REF	93	LAST	476	04,2752 0 4555 0	TC BANKCALL
1398	REF	2	LAST	240	04,2753 20465 1	CADR GOMARKP
1399	REF	19	LAST	420	04,2754 1 5423 0	TCF ENDEXT
1400					04,2755 1 2757 1	TCF +2
1401					04,2756 1 2751 1	TCF -5
1402	REF	4	LAST	494	04,2757 53*052 0	DXCH DSPIEMX
1403					04,2760 0 0006 1	EXTEND
1404	REF	1			04,2761 1 3070 1	BZF LREGCHK
1405	REF	237	LAST	479	04,2762 52 155 1	ASTROTIM DXCH MPAC
1406	REF	49	LAST	474	04,2763 0 6006 1	TC INTPRET
1407					04,2764 77634 0	RTB
1408	REF	1			04,2765 45713 0	DPMODE
1409	REF	9	LAST	490	04,2766 34041 0	R36 INT STCALL TDEC1
1410	REF	2	LAST	450	04,2767 27036 1	OTHPREC
1411					04,2770 63375 0	VLOAD POVL
1412	REF	4	LAST	490	04,2771 00007 0	VATT
1413	REF	7	LAST	490	04,2772 00001 0	RATT
1414	REF	4	LAST	494	04,2773 02327 0	STORE RPASS36
1415					04,2774 63256 0	UNIT POVL
1416					04,2775 53435 0	VXV UNIT
1417					04,2776 77626 0	STADR
1418	REF	1			04,2777 61442 1	STOOL UNP36
1419	REF	2	LAST	451	04,3000 00015 0	TAT
1420	REF	10	LAST	494	04,3001 34041 0	STCALL TDEC1
1421	REF	2	LAST	450	04,3002 27022 1	THISPREC
1422					04,3003 63375 0	VLOAD POVL
1423	REF	5	LAST	494	04,3004 00007 0	VATT
1424	REF	6	LAST	494	04,3005 00001 0	RATT
1425					04,3006 77725 1	POOL
1426	REF	3	LAST	494	04,3007 00015 0	TAT
1427					04,3010 24037 0	STOVL 30D
1428					04,3011 41406 0	PUSH PUSH
1429					04,3012 63245 1	BVSU POVL
1430	REF	5	LAST	494	04,3013 02327 0	RPASS36
1431					04,3014 72441 0	DOT SL1
1432	REF	2	LAST	494	04,3015 02335 0	UNP36
1433	REF	9	LAST	277	04,3016 26321 0	STOVL RANGE
1434					04,3017 00001 0	00D
1435					04,3020 72441 0	DOT SL1
1436	REF	3	LAST	494	04,3021 02335 0	UNP36
1437	REF	5	LAST	277	04,3022 26323 1	STOVL RRATE
1438					04,3023 00007 0	06D

SET TIME OF EVENT TO ZERO FOR FIRST DISPLAY

TERMINATE
PROCEED
RECYCLE FOR ASTRONAUT INPUT TIME

A-REG ZERO GOTO CHECK L-REG FOR ZERO
A-REG NON-ZERO, TIME = ASTRO INPUT TIME

VELOCITY VECTOR V A 00D

SAVE TIME IN LOCATION 30D FOR REDISPLAY

POSITION VECTOR R IN 06D AND 12D

LINE OF SIGHT VECTOR R - R 12D

Y = U .R A

Y = U .V A



L P34-P35, P74-P75

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1439		04,3024	41456 0	UNIT	PUSH			
1440		04,3025	47235 0	VXV	VXV			
1441		04,3026	00001 0		00D			
1442		04,3027	00023 0		18D			
1443		04,3030	53552 0	VSL2	UNIT			
144305		04,3031	77656 1	UNIT				
1444		04,3032	24001 0	STOVL	00D			
1445		04,3033	00023 0		18D			
1446		04,3034	74241 0	DOT	VXSC			
1447		04,3035	00015 0		12D			
1448		04,3036	77752 1	VSL2				
1449		04,3037	53445 1	BVSU	UNIT			
144905		04,3040	77656 1	UNIT				
1450		04,3041	50208 0	PUSH	DOT			
1451		04,3042	00001 0		00D			
1452		04,3043	65552 0	SL1	ARCCOS			
1453	REF	8	LAST	277	04,3044	28325 1	STOVL	RTHETA
1454		04,3045	50235 0	VXV	DOT			
1455		04,3046	00001 0		00D			
1456		04,3047	71244 0	BPL	DLOAD			
1457	REF	1			04,3050	11055 1	R38TAG2	
1458	REF	1			04,3051	11467 1	LDDPMAX	
1459		04,3052	77625 0	DSU				
1460	REF	7	LAST	495	04,3053	02325 1		RTHETA
1461	REF	6	LAST	495	04,3054	02325 1	STORE	RTHETA
1462		04,3055	47145 1	R38TAG2	DLOAD	RTB		
1463		04,3056	00037 0			30D		
1464	REF	2	LAST	419	04,3057	45541 0	SQAGREE	
1465	REF	5	LAST	494	04,3060	01052 1	STORE	DSPTMX
1466		04,3061	77776 1				EXIT	
1467	REF	1			04,3062	3'3102 1	CAP	V06N90N
1468	REF	94	LAST	494	04,3063	0 4555 0	TC	BANKCALL
1469	REF	3	LAST	494	04,3064	20465 1	CADR	GOMARKP
1470	REF	20	LAST	494	04,3065	1 5423 0	TCF	ENDEXT
1471	REF	21	LAST	495	04,3066	1 5423 0	TCF	ENDEXT
1472	REF	2	LAST	260	04,3067	1 2751 1	TCF	R36 +3
1473	REF	58	LAST	442	04,3070	56 001 0	LREGCHK	XCH
1474		04,3071	0 0006 1				EXTEND	L
1475	REF	1			04,3072	1 3075 1	BZF	ENTTIM2
1476	REF	57	LAST	495	04,3073	56 001 0	XCH	L
1477	REF	1			04,3074	1 2762 1	TCF	ASTROTIM
1478	REF	50	LAST	494	04,3075	0 6006 1	ENTTIM2	TC
1479		04,3076	52034 1				RTB	GOTO
1480	REF	4	LAST	460	04,3077	45505 0		LOADTIME
1481	REF	1			04,3100	10766 1		R36INT
1482		04,3101	01420 0	V06N16N	VN			00616
1483		04,3102	01532 1	V06N90N	VN			00690

U = UNIT(R) 18D
RA A(U XV)XU =U
RA A RA A

UNIT HORIZONTAL IN FORWARD DIR. 00D

-
U
L

LOS PROJECTED INTO HORIZONTAL PLANE 12D

PSI= ARCCOS(U .U)
A L

DISPLAY Y , YDOT , AND PSI

TERMINATE
PROCEED , END OF PROGRAM
REDISPLAY OUTPUTL-REG ZERO ,SET TIME = PRESENT TIME
L-REG NON ZERO, TIME = ASTRO INPUT TIME



L R31

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P3000

3001				34,2002			BANK 34
3002	REF	1		35,2000			SETLOC R31
3003				35,3150			BANK
3004	REF	1					COUNT* \$S/R31
30041	REF	1		35,3150	3 4752 0	R31CALL	CAP PRI03
30042	REF	17	LAST	430	35,3151 0 5042 1		TC FINDVAC
30043	REF	12	LAST	473	E4,1770		EBANK= SUBEXIT
30044	REF	2	LAST	32	35,3152 03204 1		2CADR V63CALL
30044				35,3153	72064 0		
30045	REF	3	LAST	473	35,3154 3 4734 0	DSPDELY	CAP 1SEC
30046	REF	95	LAST	495	35,3155 0 4555 0		TC BANKCALL
30047	REF	3	LAST	473	35,3156 01732 0		CADR DELAYJOB
30048	REF	9	LAST	231	35,3157 3 1044 0		CA EXTIVBACT
300485	REF	21	LAST	365	35,3160 7 4877 1		MASK BIT12
30049				35,3161	0 0006 1		EXTEND
300495	REF	1		35,3162	1 3154 0		BZF DSPDELY
3005	REF	7	LAST	280	35,3163 3 0105 0	DISPN5X	CA FLAGWRD9
30051	REF	23	LAST	380	35,3164 7 4707 1		MASK BIT4
300515				35,3165	0 0006 1		EXTEND
30052				35,3166	1 3171 1		BZF +3
30053	REF	1		35,3167	3 3310 0		CAP V16N54
30054				35,3170	0 3172 0		TC +2
30055	REF	1		35,3171	3 3311 1		CAP V16N53
3006	REF	96	LAST	496	35,3172 0 4555 0		TC BANKCALL
3007	REF	4	LAST	495	35,3173 20465 1		CADR GOMARKF
3008	REF	1		35,3174	0 5514 1		TC B5OFF
3009	REF	2	LAST	496	35,3175 0 5514 1		TC B5OFF
3010	REF	1		35,3176	1 3163 1		TC DISPN5X
3014	REF	51	LAST	495	35,3177 0 6006 1	V63	TC INTERPRET
3015				35,3200	77624 1		CALL
3016	REF	1		35,3201	73426 0		REDCEXTIP
3017				35,3202	77650 1		GOTO
3018	REF	1		35,3203	73207 0		COMPDISP
3019	REF	52	LAST	496	35,3204 0 6006 1	V63CALL	TC INTERPRET
3020				35,3205	77624 1		CALL
3021	REF	1		35,3206	73312 0		STATEXTIP
3022				35,3207	52375 1	COMPDISP	VLOAD
3023	REF	9	LAST	494	35,3210 00001 0		VSU
3024	REF	3	LAST	89	35,3211 02327 0		RATT
3025				35,3212	51408 1		RONE
3029	REF	10	LAST	494	35,3213 02321 0		PUSH ARVAL
3030				35,3214	77301 0		STORE RANGE
3031	REF	5	LAST	481	35,3215 00047 1		NORM VLOAD
30315				35,3216	77762 1		X1
3032				35,3217	53457 1	V5R1	
						VSL*	UNIT

TEST R31FLAG (IN SUNDANCE R31FLAG WILL ALWAYS BE SET AS R34 DOES NOT EXIST)

R31 USE NOUN 54

R34 USE NOUN 53

EXTRAPOLATE STATE VECTORS

RATT-RONE TO 0D PD= 6
METERS B-29

RATT-RONE PD= 0



L R31

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3033 35,3220 20201 0
3034 35,3221 52315 1
3035 REF 6 LAST 494 35,3222 00007 0
3036 REF 2 LAST 69 35,3223 02335 0
3037 35,3224 77641 1
3039 35,3225 77752 1
3040 REF 6 LAST 494 35,3226 36323 0
3041 REF 1 35,3227 47432 1
30411 35,3230 77624 1
30412 REF 1 35,3231 62000 0
3042 35,3232 53575 0 R34ANG
3043 REF 4 LAST 488 35,3233 02327 0
3044 35,3234 77715 1
3045 REF 1 35,3235 15330 0
30452 35,3236 77214 0
30454 REF 1 35,3237 04713 0
30455 35,3240 73242 1
30456 35,3241 00015 0
30456 35,3242 77624 1
3046 REF 1 35,3243 47601 0
3047 35,3244 41505 1
3048 REF 4 LAST 465 35,3245 01736 1
3049 35,3246 72431 1
3050 35,3247 00001 0
3051 35,3250 53445 1
3052 35,3251 00007 0
3053 35,3252 47315 0
3054 REF 5 LAST 497 35,3253 02327 0
3055 REF 3 LAST 497 35,3254 02335 0
3056 35,3255 47256 0
3057 REF 6 LAST 497 35,3256 02327 0
3058 35,3257 63241 0
3059 35,3260 00015 0
3060 35,3261 50372 1
3061 35,3262 00007 0
3062 35,3263 72565 1
3063 35,3264 00015 0
3064 35,3265 77726 1
3065 REF 9 LAST 495 35,3266 26325 1
3066 REF 7 LAST 497 35,3267 02327 0
3067 35,3270 51041 0
3068 35,3271 00007 0
3069 35,3272 73277 1
3070 35,3273 44345 0
3071 REF 10 LAST 497 35,3274 02325 1
3072 REF 5 LAST 469 35,3275 15340 1
3073 REF 11 LAST 497 35,3276 02325 1
3074 35,3277 77776 1
3075 REF 26 LAST 439 35,3300 3 4706 1
30751 REF 10 LAST 496 35,3301 7 1044 1

0,1
PDVL VSU UNIT(LOS) TO 0D PD= 6
VATT
VONE
DOT (VATT-VONE).UNIT(LOS) PD= 0
SL1
STCALL RRATE RANGE RATE M/CS B-7
CDUTRIG TO INITIALIZE FOR *NBS**
CALL R34LOS NOTE. PDL MUST = 0.
VLOAD UNIT
RONE
PDVL UR TO 0D PD= 6
THISAXIS UNITX FOR CM, UNITZ FOR LM
BON VLOAD CHK R31FLAG. ON=R31 THETA, OFF=R34 PHI
R31FLAG
+2 R31-THETA
12D
CALL *NBS**
VXM PUSH UXORZ TO 6D PD=12D
REFSMAT
VPROJ VSL2
6D
BVSU UNIT
6D
PDVL UP/2 TO 12D PD=18D
VXV
RONE
VONE
UNIT VXV
RONE
DOT PDVL SIGN TO 12D, UP/2 TO MPAC PD=18D
12D
VSL1 DOT UP,UXORZ
6D
SIGN SL1
12D
ACOS
STOVL RTHETA
RONE
DOT BPL
6D
+5
DLOAD BDSU IF UXORZ.R NEG, RTHETA = 1 - RTHETA
RTHETA
DPPOS MAX
STORE RTHETA RTHETA BETWEEN 0 AND 1 REV.
EXIT
CAP BITS HAVE WE BEEN ANSWERED
MASK EXTRACT



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L R31

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3076					35,3302	0 0008 1	EXTEND		
3077	REF	22	LAST	495	35,3303	1 5423 0	BZF	ENDEXT	YES, DIE
3078	REF	11	LAST	497	35,3304	4 1044 1	CS	EXTVBACT	
3079	REF	22	LAST	498	35,3305	7 4877 1	MASK	BIT12	
3080	REF	12	LAST	498	35,3308	27=044 1	ADS	EXTVBACT	
30805	REF	1			35,3307	1 3177 1	TCP	V83	
3081					35,3310	04088 0 V18N54	VN	1854	
3082					35,3311	04085 0 V18N53	VN	1853	



L R31

USER=S PAGE NO. 4 EQ S3

P3083 THE STATEXP SUBROUTINE DOES A PRECISION EXTRAPOLATION OF BOTH VEHICLES
R3084 STATE VECTORS TO PRESENT TIME AND SAVES THEM AS BASE VECTORS.

R3085 IF SERVICER IS OFF ---

R3086 THIS VEHICLES BASE VECTOR IS CONIC EXTRAPOLATED TO
R3087 PRESENT TIME AND SAVED AS RONE, VONE.
R3088 THE OTHER VEHICLES BASE VECTOR IS CONIC EXTRAPOLATED
R3089 TO THE SAME TIME, THE OUTPUT BEING LEFT IN RATT, VATT.

R3090 IF SERVICER IS ON ---

R3091 RONE, VONE ARE SET EQUAL TO RN, VN AND THE OTHER
R3092 VEHICLES STATE VECTOR IS PREC. EXTRAPOLATED TO PIPTIME.

3093				35,3312	47020 0	STATXP STO	RTB	
3094	REP	1		35,3313	00112 0		STATXPIT	
3095	REP	5	LAST	495	35,3314	45505 0	LOADTIME	
3098	REP	11	LAST	494	35,3315	34041 0	STCALL TDEC1	
3097	REP	3	LAST	494	35,3316	27038 1	OTHPREC	GET BASE VECTORS
3098				35,3317	77775 1	VLOAD		
3099	REP	2	LAST	482	35,3320	00017 1	RATT1	
3100	REP	1		35,3321	28225 0	STOVL	BASEOTP	OTHER POS.
3101	REP	2	LAST	482	35,3322	00025 0	VATT1	
3102	REP	1		35,3323	18241 1	STODL	BASEOTV	OTHER VEL.
3103	REP	4	LAST	494	35,3324	00015 0	TAT	
3104	REP	1		35,3325	02272 1	STORE	BASETIME	
3105	REP	12	LAST	499	35,3326	34041 0	STCALL TDEC1	
3106	REP	3	LAST	494	35,3327	27022 1	THISPREC	
3107				35,3330	77775 1	VLOAD		
3108	REP	3	LAST	499	35,3331	00017 1	RATT1	
3109	REP	1		35,3332	28255 1	STOVL	BASEHP	THIS POS.
3110	REP	3	LAST	499	35,3333	00025 0	VATT1	
3111	REP	1		35,3334	02283 1	STORE	BASEHPV	THIS VEL
3112				35,3335	47014 1	HAVEBASE BQN	RTB	
3113	REP	1		35,3336	03711 0		V37FLAG	
3114	REP	1		35,3337	73413 0		GSTRVN	IF AVG ON ,GET RN ETC.
3115	REP	6	LAST	499	35,3340	45505 0	LOADTIME	
3116	REP	13	LAST	499	35,3341	34041 0	STCALL TDEC1	BEGIN SET UP FOR CONIC EXTRAP. FOR THIS.
3117	REP	8	LAST	481	35,3342	27371 1	INTSTALL	
3118				35,3343	43175 0	VLOAD	CLEAR	
3119	REP	2	LAST	499	35,3344	02255 1	BASEHP	
3120	REP	5	LAST	481	35,3345	00263 0	MOONFLAG	
3121	REP	6	LAST	482	35,3348	25535 0	STOVL	RCV
3122	REP	2	LAST	499	35,3347	02263 1	BASEHPV	
3123	REP	6	LAST	482	35,3350	15543 1	STODL	VCV
3124	REP	2	LAST	499	35,3351	02272 1	BASETIME	
3125				35,3352	43014 0	ROP	SET	GET APPROPRIATE MOONFLAG SETTING
3128	REP	4	LAST	280	35,3353	04343 1	MOONTHIS	
3127				35,3354	73358 0		+2	
3128	REP	6	LAST	499	35,3355	00083 1	MOONFLAG	
3129				35,3356	77814 1	SET		
3130	REP	4	LAST	482	35,3357	01473 0	INTYPFLG	CONIC EXTRAP.
3131	REP	6	LAST	482	35,3360	35517 1	STCALL TET	
3132	REP	3	LAST	482	35,3361	27068 1	INTEGRVS	INTEGRATION --- AT LAST---



L R31

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3133				35,3362	77775 1		
3134	REF	10	LAST	498	35,3383	00001 0	VLOAD
3135	REF	8	LAST	497	35,3384	26327 0	RATT
3136	REF	7	LAST	497	35,3385	00007 0	STOVL RONE
3137	REF	4	LAST	497	35,3386	38335 1	VATT
3138	REF	9	LAST	499	35,3387	27371 1	STCALL VONE
3139				35,3370	71214 0		INTSTALL
3140	REF	5	LAST	499	35,3371	01473 0	SET DLOAD
3141	REF	5	LAST	499	35,3372	00015 0	INTYPFLG
3142	REF	14	LAST	499	35,3373	00041 1	TAT
3143				35,3374	43175 0	OTHINT	STORE TDEC1
3144	REF	2	LAST	499	35,3375	02225 0	VLOAD CLEAR
3145	REF	7	LAST	499	35,3376	00283 0	BASEOTP
3146	REF	7	LAST	499	35,3377	25535 0	MOONFLAG
3147	REF	2	LAST	499	35,3400	02241 1	STOVL RCV
3148	REF	7	LAST	499	35,3401	15543 1	BASEOTV
3149	REF	3	LAST	499	35,3402	02272 1	STODL VOV
3150				35,3403	43014 0		BASETIME
3151	REF	5	LAST	499	35,3404	04343 1	ROP SET
3152				35,3405	73407 0		MOONTHIS
3153	REF	8	LAST	500	35,3406	00083 1	+2
3154	REF	7	LAST	499	35,3407	35517 1	MOONFLAG
3155	REF	4	LAST	499	35,3410	27068 1	STCALL TET
3156				35,3411	77850 1		INTEGRVS
3157	REF	2	LAST	499	35,3412	00112 0	GOTO
							STATEXIT
3158				35,3413	77775 1	GETRNV	VLOAD
3159	REF	5	LAST	284	35,3414	01171 1	RN
3160	REF	9	LAST	500	35,3415	26327 0	STOVL RONE
3161	REF	5	LAST	284	35,3416	01177 1	VN
3162	REF	5	LAST	500	35,3417	16335 0	STODL VONE
3163	REF	4	LAST	284	35,3420	01205 1	PIPTIME
3164				35,3421	77624 1		CALL
3165	REF	10	LAST	500	35,3422	27371 1	INTSTALL
3166				35,3423	52014 0		CLEAR GOTO
3167	REF	6	LAST	500	35,3424	01673 1	INTYPFLG
3168	REF	1			35,3425	73373 1	OTHINT
3169				35,3426	52020 1	REDOEXTP	STO GOTO
3170	REF	3	LAST	500	35,3427	00112 0	STATEXIT
3171	REF	1			35,3430	73335 0	HAVERASE
3172	REF	1			31,2000		SETLOC R34
3173				31,2000			BANK
3174				31,2000	77778 1	R34LOS	EXIT
3175	REF	8	LAST	277	31,2001	3 0038 1	CA CDUS
3176	REF	2	LAST	259	31,2002	50 120 1	INDEX FIXLOC
3177				31,2003	54 011 0		TS 9D
3178	REF	7	LAST	277	31,2004	3 0035 1	CA CDUT
3179	REF	3	LAST	500	31,2005	50 120 1	INDEX FIXLOC
3180				31,2006	54 013 1		TS 11D

GET SET FOR CONIC EXTRAP., OTHER.

THIS VEHICLES POS., VEL. IN PUSHLIST.

PREC EXTRAP FOR OTHER



L R31

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3181	REF	4	LAST	500	31,2007	3 0120 1
3182	REF	17	LAST	444	31,2010	6 6211 0
3183					31,2011	4 0000 0
3184	REF	5	LAST	501	31,2012	50 120 1
3185	REF	6	LAST	496	31,2013	54 046 1
3186	REF	53	LAST	496	31,2014	0 6008 1
3187					31,2015	77624 1
3188	REF	2	LAST	447	31,2016	46000 0
3189					31,2017	34015 1
3190	REF	1			31,2020	73232 0

CA	FIXLOC
AD	SIX
CON	
INDEX	FIXLOC
TS	X1
TC	INTPRET
CALL	
	SCINB
STCALL	12D
	R34ANG



L P76

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P5000 1) PROGRAM NAME - TARGET DELTA V PROGRAM (P76).
R5001 2) FUNCTIONAL DESCRIPTION - UPON ENTRY BY ASTRONAUT ACTION, P76 FLASHES DSKY REQUESTS TO THE ASTRONAUT
R5003 TO PROVIDE VIA DSKY (1) THE DELTA V TO BE APPLIED TO THE OTHER VEHICLE STATE VECTOR AND (2) THE
R5005 TIME (TIG) AT WHICH THE OTHER VEHICLE VELOCITY WAS CHANGED BY EXECUTION OF A THRUSTING MANEUVER. THE
R5007 OTHER VEHICLE STATE VECTOR IS INTEGRATED TO TIG AND UPDATED BY THE ADDITION OF DELTA V (DELTA V HAVING
R5009 BEEN TRANSFORMED FROM LV TO REF COSYS). USING INTEGRVS, THE PROGRAM THEN INTEGRATES THE OTHER
R5011 VEHICLE STATE VECTOR TO THE STATE VECTOR OF THIS VEHICLE, THUS INSURING THAT THE W-MATRIX AND BOTH VEHICLE
R5013 STATES CORRESPOND TO THE SAME TIME.
R5014 3) ERASABLE INITIALIZATION REQUIRED - NONE.
R5015 4) CALLING SEQUENCES AND EXIT MODES - CALLED BY ASTRONAUT REQUEST THRU DSKY V 37 E 76 E.
R5017 EXITS BY TOP ENDPJOB.
R5016 5) OUTPUT - OTHER VEHICLE STATE VECTOR INTEGRATED TO TIG AND INCREMENTED BY DELTA V IN REF COSYS.
R5020 THE PUSHLIST CONTAINS THE MATRIX BY WHICH THE INPUT DELTA V MUST BE POST-MULTIPLIED TO CONVERT FROM LV
R5022 TO REF COSYS.
R5023 6) DEBRIS - OTHER VEHICLE STATE VECTOR.
R5024 7) SUBROUTINES CALLED - BANKCALL, GCONDSP, CSMPREC (OR LEMPREC), ATOPCSM (OR ATOPLEM), INTSTALL, INTWAKE, PHASCHNG
R5026 INTERPT, INTEGRVS, AND MINIRECT.

R5027 6) FLAG USE - MOONFLAG, MOONPLAG, INTYPLG, BASFLAG, AND MARKCTR.

5028 REP 1 30,2000 BANK 30
5029 13,2000 SETLOC P76LOC
5030 13,2036 BANK

5031 REF 1 COUNT* SS/P76

5032 REF 20 LAST 469 E7,1412 EBANK= TIG

5033 REF 17 LAST 474 13,2036 0 5435 0 P76 TC UPFLAG
5034 REF 2 LAST 253 13,2037 00031 0 ADRES TRACKPLG

5035 REF 1 13,2040 3 2163 1 CAP V06N84
5040 REF 97 LAST 496 13,2041 0 4555 0 TC BANKCALL
5041 REF 14 LAST 476 13,2042 20624 0 CADR GOFASH
5042 REF 1 13,2043 1 2155 0 TOP ENDP76
5043 13,2044 0 2046 1 TC +2
5044 13,2045 0 2040 1 TC -5
5045 REF 2 LAST 502 13,2046 3 2164 0 CAP V06N64 +1
5046 REF 96 LAST 502 13,2047 0 4555 0 TC BANKCALL
5047 REF 15 LAST 502 13,2050 20624 0 CADR GOFASH
5048 REF 2 LAST 502 13,2051 1 2155 0 TOP ENDP76
5049 13,2052 0 2054 1 TC +2
5050 13,2053 0 2046 1 TC -5
5051 REF 54 LAST 501 13,2054 0 6006 1 TC INTPRET
5052 13,2055 77745 1 DLOAD
5053 REF 21 LAST 562 13,2056 03413 1 TIG
5054 REF 15 LAST 500 13,2057 34041 0 STCALL TDEC1
5055 REF 4 LAST 499 13,2060 27036 1 OTHPREC
5056 13,2061 53575 0 COMPAT VLOAD UNIT
5057 REF 11 LAST 500 13,2062 00001 0 RATT

FLASH LAST DELTA V,
AND WAIT FOR KEYBOARD ACTION.

PROCEED
STORE DATA AND REPEAT FLASHING
FLASH VERR 06 NOUN 33, DISPLAY LAST TIG,
AND WAIT FOR KEYBOARD ACTION.

RETURN TO INTERPRETIVE CODE
SET D(MPAC)=TIG IN CSEC B26

SET TDEC1=TIG FOR ORBITAL INTEGRATION

L P76

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5058 13,2063 77676 0
 5059 13,2064 00031 0
 5060 13,2065 53435 0
 5061 REF 8 LAST 500 13,2066 00007 0
 5062 13,2067 00023 0
 5063 13,2070 53435 0
 5064 13,2071 00031 0
 5065 13,2072 24015 0
 5066 REF 4 LAST 277 13,2073 03540 0
 5067 13,2074 76505 0
 5068 13,2075 00015 0
 5069 13,2076 77655 1
 5070 REF 9 LAST 503 13,2077 00007 0
 5071 13,2100 00007 0
 5072 13,2101 77624 1
 5073 REF 11 LAST 500 13,2102 27371 1
 5074 13,2103 77624 1
 5075 REF 1 13,2104 26165 1
 5076 13,2105 53775 1
 5077 13,2106 00007 0
 5078 13,2107 57176 0
 5079 REF 8 LAST 500 13,2110 25543 1
 5080 REF 12 LAST 502 13,2111 00001 0
 5081 13,2112 77657 0
 5082 13,2113 57176 0
 5083 REF 8 LAST 500 13,2114 15535 0
 5084 REF 22 LAST 502 13,2115 03413 1
 5085 REF 8 LAST 500 13,2116 01517 0
 5086 13,2117 71214 0
 5087 REF 7 LAST 500 13,2120 01673 1
 5088 REF 1 13,2121 01571 0
 5089 REF 16 LAST 502 13,2122 34041 0
 5090 REF 5 LAST 500 13,2123 27066 1
 5091 13,2124 77624 1
 5093 REF 12 LAST 503 13,2125 27371 1
 5094 13,2126 77775 1
 5095 REF 4 LAST 499 13,2127 00017 1
 5096 REF 2 LAST 83 13,2130 01503 0
 5097 REF 9 LAST 503 13,2131 15535 0
 5098 REF 6 LAST 500 13,2132 00015 0
 5099 REF 9 LAST 503 13,2133 25517 0
 5100 REF 4 LAST 499 13,2134 00025 0
 5101 13,2135 77624 1
 5102 REF 1 13,2136 23360 0
 5103 13,2137 77776 1
 5104 REF 22 LAST 474 13,2140 0 5301 0
 5105 13,2141 04024 0
 5106 REF 18 LAST 502 13,2142 0 5435 0
 5107 REF 1 13,2143 00236 0

VCOMP
 STORE 24D
 VXV UNIT
 VATT
 STORE 18D
 VXV UNIT
 24D
 STOVL 12D
 DELVOW
 VXM VSL1
 12D
 VAD
 VATT
 STORE 6
 CALL
 INTSTALL
 CALL
 P76SUB1
 VLOAD VSR*
 6
 0,2
 STOVL VCV
 RATT
 VSR*
 0,2
 STOVL ROV
 TIG
 STORE TET
 CLEAR DLOAD
 INTYPFLG
 TETHIS
 INTOHIS STCALL TDEC1
 INTEGRVS
 CALL
 INTSTALL
 VLOAD
 RATT1
 STORE RRECT
 STOVL ROV
 TAT
 STOVL TET
 VATT1
 CALL
 MINIRECT
 EXIT
 TC PHASCHNG
 OCT 04024
 TC UPFLAG
 ADRES REINTPLG

U(-R)
 U(-R) TO 24D
 U(-R)XV = U(VXR)
 U(VXR)XU(-R) = U(RXV)XR
 V(MPAC)=DELTA V IN REPCOSYS
 V(PD6)=VATT + DELTA V
 PREVENT WOULD-BE USER OF ORBITAL
 INTEG FROM INTERFERING WITH UPDATING



L P76

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5109	REF	55	LAST	502	13,2144	0 6006 1	TC	INTPRET
5110					13,2145	77624 1	CALL	
5111	REF	1			13,2146	28711 1		ATOPOTH
5116					13,2147	77531 0	SSP	EXIT
5117	REF	9	LAST	446	13,2150	00053 1		OPRET
5118	REF	1			13,2151	26154 0		OUT
5119	REF	99	LAST	502	13,2152	0 4555 0	TC	BANKCALL
5120	REF	1			13,2153	27428 1	CADR	INTWAKE1
5121					13,2154	77776 1	OUT	EXIT
5125	REF	107	LAST	494	13,2155	3 4714 1	ENDP76	CAP
5126	REF	1			13,2156	55*126 1	TS	ZERO
51285	REF	4	LAST	274	13,2157	55*125 1	TS	MARKCTR
							TS	VHPCNT
5127	REF	11	LAST	297	13,2160	3 7716 0	CAP	NEGONE
5128	REF	6	LAST	222	13,2161	55*734 1	TS	MRKBUF2
5129	REF	12	LAST	476	13,2162	1 4106 0	TCP	GOTOPOCH
5130					13,2163	01524 0	V06N64	NV
5131					13,2164	01441 1		0664
5132					13,2165	43174 1	P76SUB1	NV
5133					13,2166	00002 0	AXT, 2	0633
5134	REF	9	LAST	500	13,2167	00063 1		SET
5135					13,2170	77014 1		2
5136	REF	5	LAST	466	13,2171	04303 0	BON	MOONFLAG
5137	REF	10	LAST	504	13,2172	00052 0		AXT, 2
5138					13,2173	00000 1		CMOONFLG
5139					13,2174	43414 1		OPRET
5140	REF	10	LAST	504	13,2175	00263 0	CLEAR	0
								RVO
								MOONFLAG

PERMIT USE OF ORBITAL INTEGRATION

CLEAR RR TRACKING MARK COUNTER

INVALIDATE MARK BUFFER

SET MEANS MOON IS SPHERE OF INFLUENCE.

SET MEANS PERM CM STATE IN LUNAR SPHERE.

L R30

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P5200 SUBROUTINE NAME' V82CALL

R5201 MOD NO' 0

DATE' 16 FEB 67

R5203 MOD BY' RR BAINSFATHER

LOG SECTION' R30

R5205 MOD NO' 1 MOD BY' RR BAINSFATHER

DATE' 11 APR 67

SR30.1 CHANGED TO ALLOW MONITOR OPERN

R5208 MOD NO' 2 MOD BY ALONSO

DATE' 11 DEC 67

VB82 PROGRAM REWRITTEN

R52095 MOD NO' 3 MOD BY ALONSO

DATE' 28 MAR 68

PROG MOD TO HANDLE DIP EARTH/MOON SCALE

R5210 NEW FUNCTIONAL DESCRIPTION' CALLED BY VERB 82 ENTER. PRIORITY 10

R5211 USED THROUGHOUT. CALCULATE AND DISPLAY ORBITAL PARAMETERS

R5212 1. IF AVERAGE G IS OFF'

R5213 FLASH DISPLAY V04N06. R2 INDICATES WHICH SHIP'S STATE VECTOR IS

R5214 TO BE UPDATED. INITIAL CHOICE IS THIS SHIP (R2=1). ASTRONAUT

R5215 CAN CHANGE TO OTHER SHIP BY V22EXE, WHERE X NOT EQ 1.

R5216 SELECTED STATE VECTOR UPDATED BY THISPREC (OTHPREC).

R5217 CALLS SR30.1 (WHICH CALLS TFFCONMU + TFFRP/RA) TO CALCULATE

R5218 RPER (PERIGEE RADIUS), RAPO (APOGEE RADIUS), HPER (PERIGEE

R5219 HEIGHT ABOVE LAUNCH PAD OR LUNAR LANDING SITE), HAPO (APOGEE

R5220 HEIGHT AS ABOVE), TPER (TIME TO PERIGEE), TPF (TIME TO

R5221 INTERSECT 300 KFT ABOVE PAD OR 35KFT ABOVE LANDING SITE).

R5222 FLASH MONITOR V16N44 (HAPO, HPER, TPF). TPF IS -59M59S IF IT WAS

R5223 NOT COMPUTABLE, OTHERWISE IT INCREMENTS ONCE PER SECOND.

R5224 ASTRONAUT HAS OPTION TO MONITOR TPER BY KEYING IN N 32 E.

R5225 DISPLAY IS IN HMS, IS NEGATIVE (AS WAS TPF), AND INCREMENTS

R5226 ONCE PER SECOND ONLY IF TPF DISPLAY WAS -59M59S.

R5227 2. IF AVERAGE G IS ON'

R5228 CALLS SR30.1 APPROX EVERY TWO SECS. STATE VECTOR IS ALWAYS

R5229 FOR THIS VEHICLE. V82 DOES NOT DISTURB STATE VECTOR. RESULTS

R5230 OF SR30.1 ARE RAPO, RPER, HAPO, HPER, TPER, TPF.

R5231 FLASH MONITOR V16N44 (HAPO, HPER, TPF).

R5232 IF MODE IS P11, THEN CALL DELRSPL SO ASTRONAUT CAN MONITOR

R5233 RESULTS BY N50E. SPLASH COMPUTATION DONE ONCE PER TWO SECS.

R52331 ADDENDUM' HAPO AND HPER SHOULD BE CHANGED TO READ HAPOX AND HPERX IN THE

R52332 ABOVE REMARKS.

R5234 CALLING SEQUENCE' VERB 82 ENTER.

R5235 SUBROUTINES CALLED' SR30.1, GOXDSPP

R5236 MAYBE - THISPREC, OTHPREC, LOADTIME, DELRSPL

R5237 NORMAL EXIT MODES' TC ENDEXT

R5238 ALARMS' NONE

R5239 OUTPUT' HAPOX (-29) M

R5240 HPERX (-29) M

R5241 RAPO (-29) M EARTH

R52411 (-27) M MOON



L R30

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R5242 RPER (-29) M EARTH
R52421 (-27) M MOON
R5243 TFF (-26) CS CONTAINS NEGATIVE QUANTITY
R5244 -TPER (-26) CS CONTAINS NEGATIVE QUANTITY
R5245 RSP-RREC (-29) M IF DELRSPL CALLED

R5246 ERASABLE INITIALIZATION REQUIRED' STATE VECTOR.

R5247 DEBRIS' QPRET, RONE, VONE, TFF/RTM, HPERMIN, RPADTEM, V82EMPLG.
R5248 MAYBE' TSTART82, V82FLAGS, TDEC1.

5249 REP 3 LAST 274 E4,1751 EBANK= HAPOX
5250 31,2021 BANK 31
5251 REP 1 23,2000 SETLOC R30LOC
5252 23,2332 BANK
5253 REP 1 COUNT* SS/R30

5254 REP 58 LAST 504 23,2332 0 8008 1 V82CALL TC INTERPRET
5255 23,2333 52014 0 BQN GOTO
5256 REP 1 23,2334 00718 1 AVEGFLAG
5257 REP 1 23,2335 48588 0 V82GON
5258 REP 1 23,2336 48337 1 V82GOFF
5259 23,2337 77778 1 V82GOFF EXIT
5260 REP 28 LAST 444 23,2340 3 4711 1 CAP TWO
5261 REP 2 LAST 288 23,2341 55*051 0 TS OPTIONX
5262 REP 82 LAST 450 23,2342 3 4712 1 CAP ONE
5263 REP 3 LAST 508 23,2343 55*052 0 TS OPTIONX +1
5264 REP 1 23,2344 3 2408 1 CAP OPTIONVN
5265 REP 100 LAST 504 23,2345 0 4555 0 TC BANKCALL
5266 REP 9 LAST 257 23,2346 20465 1 CADR GOXDSPF
5267 REP 23 LAST 498 23,2347 0 5423 1 TC ENDEXT
5268 23,2350 0 2352 1 TC +2
5269 23,2351 0 2344 0 TC -5

A5270
5271 REP 24 LAST 496 23,2352 3 4707 0 CAP BIT4
5272 REP 18 LAST 409 23,2353 0 5140 1 TC WAITLIST
5273 REP 4 LAST 275 E4,1743 EBANK= TFF
5274 REP 1 23,2354 02531 1 ZCADR TICKTEST
5275 23,2355 48084 1
5276 23,2356 0 0003 1 RELINT
5276 REP 1 23,2357 3 2410 0 V82GOFF.P CAP TFFBANK
5277 REP 19 LAST 434 23,2360 54 003 0 TS EBANK
5278 REP 108 LAST 504 23,2361 3 4714 1 CAP ZERO
5279 REP 3 LAST 89 23,2362 55*742 0 TS V82FLAGS

A5280
5281 REP 5 LAST 281 23,2363 3 4756 1 CAP PRIOT
5282 REP 18 LAST 498 23,2364 0 5042 1 TC FINDVAC

IF AVERAGE G ON
IF AVERAGE G OFF
ALLOW ASTRONAUT TO SELECT VEHICLE
DESIRED FOR ORBITAL PARAMETERS

V 04 N 08

TERMINATE
PROCEED
DATA IN. OPTIONX +1 = 1 FOR THIS VEHIC.
UNEO 1 FOR OTHER VEHICLE.

80 MS

MAJOR RECYCLE LOOP ENTRY

ZERO FLAGS FOR TICKTEST. INHIBITS
DECREMENTING OF TFF AND -TPER.

V82GOFF1 WILL EXECUTE STATE VECTOR



L R30

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5283	REF	5	LAST	506	E4,1743		EBANK= TFF
5284	REF	1			23,2365	02411 1	ZCADR V82GOFF1
5284	REF	1			23,2368	46064 1	
5285					23,2367	0 0003 1	RELINT
5286	REF	14	LAST	384	23,2370	3 6214 0	V82STALL CAP THREE
5287	REF	4	LAST	506	23,2371	7 1742 0	MASK V82FLAGS
5288	REF	139	LAST	446	23,2372	10 000 0	CCS A
5289	REF	1			23,2373	0 2400 1	TC FLAGCON
5290	REF	4	LAST	496	23,2374	3 4734 0	CAP 1SEC
5291	REF	101	LAST	506	23,2375	0 4555 0	TC BANKCALL
5292	REF	4	LAST	496	23,2376	01732 0	CADR DELAYJOB
5293	REF	1			23,2377	0 2370 1	TC V82STALL
5294	REF	1			23,2400	3 2407 0	FLAGCON CAP V16N44
5295	REF	102	LAST	507	23,2401	0 4555 0	TC BANKCALL
5296	REF	10	LAST	506	23,2402	20465 1	CADR GOXDSPF
5297	REF	3	LAST	496	23,2403	0 5514 1	TC B5OFF
5298	REF	4	LAST	507	23,2404	0 5514 1	TC B5OFF
5299	REF	1			23,2405	0 2357 1	TC V82GOFLP
5300					23,2406	01014 0	OPTIONVN VN 0412
5301					23,2407	04054 1	V16N44 VN 1644
5302	REF	6	LAST	507	23,2410	02343 1	TFFBANK ECADR TFF
5303	REF	57	LAST	506	23,2411	0 6006 1	V82GOFF1 TU INTPRET
5304					23,2412	77634 0	RTB
5305	REF	7	LAST	499	23,2413	45505 0	LOADTIME
5306	REF	17	LAST	503	23,2414	00041 1	STORE TDEC1
5307	REF	1			23,2415	02325 1	STORE TSTART82
5308					23,2416	77776 1	EXIT
5309	REF	4	LAST	506	23,2417	4 1052 0	CS OPTIONX +1
5310	REF	63	LAST	506	23,2420	6 4712 1	AD ONE
5311					23,2421	0 0006 1	EXTEND
5312	REF	1			23,2422	1 2446 1	BZF THISHIP
5313	REF	58	LAST	507	23,2423	0 6006 1	OIHSHIP TC INTPRET
5314					23,2424	77624 1	CALL
5315	REF	5	LAST	502	23,2425	27036 1	OIHPREC
5316					23,2426	77775 1	BOIHSHP VLOAD
5317	REF	13	LAST	503	23,2427	00001 0	RATT
5318	REF	10	LAST	500	23,2430	26327 0	STOVL RONE
5321	REF	10	LAST	503	23,2431	00007 0	VATT
5322	REF	6	LAST	500	23,2432	02335 0	STORE VONE
5323					23,2433	77743 1	DLOAD*
5324	REF	1			23,2434	71321 1	1/RTIME,2
5325	REF	1			23,2435	00037 0	STORE TFF/RTMU
5326					23,2436	77743 1	DLOAD*
5327	REF	1			23,2437	71315 0	MINPERE,2
5328	REF	2	LAST	89	23,2440	02321 0	STORE HPERMIN
5329					23,2441	46135 1	SLOAD RHIZ

UPDATE AND ORBIT CALCULATIONS FOR
SELECTED VEHICLE ABOUT PROPER BODY.STALL IN THIS LOOP AND WITHOLD V 16 N 44
UNTIL STATE VECTOR UPDATE SETS ONE OF
OUR FLAG BITS.
EXIT FROM STALL LOOP.

MONITOR HAP0, HPER, TFF.

TERM THIS TELLS TICKTEST TO KILL ITSELF
PROCEED DITTO
RECYCLE RECOMPUTE STATE VECT + DISPLAYTIME FOR STATE VECTOR UPDATE.
TIME FOR INTERNAL USE.

1 FOR THIS VEHICLE, NOT 1 FOR OTHER

CALL STATE VECTOR UPDATE FOR OTHER SHIP.

MOVE RESULTS INTO TFFCONIC STORAGE AREAS
TO BE CALLED BY SR30.1.
RATT AT (-29)M FOR EARTH OR MOON

VATT AT (-7)M/CS FOR EARTH OR MOON

X2 IS 0 FOR EARTH CENTERED STATE VEC
X2 IS 2 FOR MOON
AS LEFT BY THISPREC OR OIHPREC.TFFPRMU, HPERMIN AND RPADTEM ARE ALL
EARTH/MOON PARAMETERS AS SET HERE.



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5330	REP	5	LAST	489	23,2442	00050 1		X2	
5331	REP	1			23,2443	46463 1		EARTH PAD	
5332					23,2444	77650 1			
5333	REP	1			23,2445	46467 0	GOTO	MOON PAD	
5334	REP	59	LAST	507	23,2446	0 6006 1	THISHIP TC	INTPRET	
5335					23,2447	77624 1	CALL		CALL STATE VECTOR UPDATE FOR THIS SHIP.
5336	REP	4	LAST	499	23,2450	27022 1		THISPREC	
5337					23,2451	77650 1	GOTO		
5338	REP	1			23,2452	46426 0		BOTHSHIP	
R5339 THE FOLLOWING CONSTANTS ARE PAIRWISE INDEXED. DO NOT SEPARATE PAIRS.									
5340					23,2453	27533 1	1/RIMM	2DEC*	.45162595 E-4 B14*
5340					23,2454	07571 0			
5341					23,2455	25004 1	1/RIMJ	2DEC*	.50087529 E-5 B17*
5341					23,2456	06702 1			
5342					23,2457	00001 0	MINPERM	2DEC	10668 B-27
5342					23,2460	11530 1			35 KPT MIN PERIGEE HEIGHT FOR MOON(-27)M
5343					23,2461	00002 0	MINPERE	2DEC	91440 B-29
5343					23,2462	31230 1			300 KPT (-29)M FOR EARTH
5344					23,2463	43145 0	EARTH PAD DLOAD	CLRGO	PAD 37-B RADIUS. SCALED AT (-29)M.
5345	REP	2	LAST	469	23,2464	05311 1		RPAD	
53455	REP	1			23,2465	04622 0		V82EMFLG	INDICATE EARTH SCALING FOR SR30.1
5346	REP	1			23,2466	46473 0		BOTH PAD	
5347					23,2467	51575 1	MOON PAD VLOAD	ARVAL	COMPUTE MOON PAD RADIUS FROM RLS VECTOR.
5348	REP	3	LAST	489	23,2470	02026 1		RLS	SCALED AT (-27)M.
5349					23,2471	77614 1		SET	
53491	REP	2	LAST	506	23,2472	04462 0			INDICATE MOON SCALING FOR SR30.1
5350	REP	2	LAST	89	23,2473	36323 0	BOTH PAD	STCALL	
5352	REP	1			23,2474	46667 1		RPADTEM	
53521					23,2475	77776 1		SR30.1	CALCULATE ORBITAL PARAMETERS
53522	REP	9	LAST	476	23,2476	3 1011 0	EXIT		
53523					23,2477	0 0006 1	CA	MODREG	ARE WE IN POO
53524	REP	1			23,2500	1 2645 0	EXTEND		
53525	REP	60	LAST	508	23,2501	0 6006 1	BZF	CANDEL	YES, DO DELRSPL
5353					23,2502	45234 0	5PLRPT1	TC	
5354	REP	6	LAST	507	23,2503	45505 0	RTB	INTPRET	
5356	REP	2	LAST	507	23,2504	02325 1		DSU	
5357	REP	3	LAST	508	23,2505	02325 1		LOADTIME	PRESENT TIME - TIME V82GOFF1 BEGAN
5356					23,2506	53145 1	STORE	TSTART82	SAVE IT
5359	REP	3	LAST	267	23,2507	02346 1	DLOAD	TSTART82	SR30.1 SETS -TPER=0 IF HPER L/
5360	REP	1			23,2510	46521 0		BZE	HPERMIN (300 OR 35) KPT.
5361					23,2511	43345 1		-TPER	(-TPER = 0)
5362	REP	4	LAST	508	23,2512	02346 1	TICKTPER DLOAD	TICKTFF	(-TPER NON ZERO) TFF WAS NOT COMPUTED,
5363	REP	4	LAST	508	23,2513	02325 1		DAD	BUT WAS SET TO 59*59S.DONT TICK TFF, DO
5364	REP	5	LAST	508	23,2514	02346 1		-TPER	TICK -TPER. DISPLAY BOTH.
5365					23,2515	77776 1	STORE	TSTART82	-TPER CORRECTED FOR TIME SINCE V82GOFF1
							EXIT	-TPER	BEGAN.

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5366	REP	36	LAST	475	23,2516	3 4712 1	CAP	BIT1	
5367	REP	5	LAST	507	23,2517	55-742 0	TS	V82FLAGS	INFORMS TICKTEST TO INCREMENT ONLY -TPER
5368	REP	59	LAST	475	23,2520	0 5112 0	TC	ENDOFJOB	
5369					23,2521	43345 1	TICKTFF	DLOAD	DAD
5370	REP	7	LAST	507	23,2522	02344 0		TFF	(-TPER=0) TFF WAS COMPUTED.TICK TFF.
5371	REP	5	LAST	508	23,2523	02325 1		TSTART82	DO NOT TICK -TPER.DISPLAY TFF, BUT NOT
5372	REP	8	LAST	509	23,2524	02344 0		TFF	-TPER.
5373					23,2525	77778 1	STORE	TFF	TFF CORRECTED FOR TIME SINCE V82G0FF1
5374	REP	22	LAST	450	23,2526	3 4711 1	EXIT		BEGAN.
5375	REP	6	LAST	509	23,2527	55-742 0	CAP	BIT2	
5376	REP	60	LAST	509	23,2530	0 5112 0	TS	V82FLAGS	INFORMS TICKTEST TO INCREMENT ONLY TFF.
5377	REP	27	LAST	497	23,2531	3 4708 1	TC	ENDOFJOB	
5378	REP	13	LAST	498	23,2532	7 1044 1	TICKTEST	CAP	BITS
5379	REP	140	LAST	507	23,2533	10 000 0	MASK	EXTVBACT	THIS WAITLIST PROGRAM PERPETUATES ITSELF
5380	REP	1			23,2534	0 2542 0	CCS	A	ONCE A SEC UNTIL BIT 5 OF EXTVBACT =0.
5381	REP	1			23,2535	3 7882 1	TC	DOTICK	
5382	REP	15	LAST	380	23,2538	0 5027 1	CAP	PRIO25	
5383	REP	14	LAST	509	1044		TC	NOVAC	TERMINATE V 82.CANT CALL ENDEXT IN RUPT.
5384	REP	24	LAST	508	23,2537	05423 1	EBANK=	EXTVBACT	
5384					23,2540	04082 1	2CADR	ENDEXT	
5385	REP	21	LAST	430	23,2541	0 5213 1	TC	TASKOVER	
5388	REP	5	LAST	507	23,2542	3 4734 0	CAP	1SEC	RE-REQUEST TICKTEST.
5387	REP	19	LAST	506	23,2543	0 5140 1	TC	WAITLIST	
5388	REP	9	LAST	509	E4,1743		EBANK=	TFF	
5389	REP	2	LAST	506	23,2544	02531 1	2CADR	TICKTEST	
5389					23,2545	48084 1			
5390	REP	15	LAST	507	23,2548	3 8214 0	CAP	THREE	
5391	REP	7	LAST	509	23,2547	7 1742 0	MASK	V82FLAGS	
5392	REP	141	LAST	509	23,2550	50 000 1	INDEX	A	
5393					23,2551	0 2552 1	TC	+1	
5394	REP	22	LAST	509	23,2552	0 5213 1	TC	TASKOVER	IF NO FLAGBITS SET DONT CHANGE TFF OR
A5395									-TPER, BUT CONTINUE LOOP.
5396	REP	1			23,2553	0, 2581 1	TC	TPERTICK	ONLY BIT 1 SET. INCR -TPER BY 1 SEC.
5397	REP	8	LAST	509	23,2554	3 4734 0	CAP	1SEC	ONLY BIT 2 SET. INCR TFF BY 1 SEC.
5398	REP	58	LAST	495	23,2555	54 001 1	TS	L	
5399	REP	109	LAST	506	23,2556	3 4714 1	CAP	ZERO	
5400	REP	10	LAST	509	23,2557	21-744 0	DAS	TFF	
5401	REP	23	LAST	509	23,2560	0 5213 1	TC	TASKOVER	
5402	REP	7	LAST	509	23,2561	3 4734 0	TPERTICK	CAP	1SEC
5403	REP	59	LAST	509	23,2562	54 001 1	TS	L	
5404	REP	110	LAST	509	23,2583	3 4714 1	CAP	ZERO	
5405	REP	6	LAST	508	23,2564	21-746 1	DAS	-TPER	
5408	REP	24	LAST	509	23,2565	0 5213 1	TC	TASKOVER	



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5407      23,2586  77776 1  V82GQN  EXIT
A5406
5409  REP  6  LAST  506  23,2587  3 4756 1  CAP  PRI07
5410  REP 19  LAST  508  23,2570  0 5042 1  TC  FINDVAC
5411  REP 11  LAST  509  E4,1743  EBANK= TFF
5412  REP  1      23,2571  02804 1  2CADR V82GQN1
5412  REP  1      23,2572  48084 1
5413      23,2573  0 0003 1  RELINT
5414  REP  3  LAST  421  23,2574  10 067 1  CCS  NEWJOB
5415  REP  2  LAST  421  23,2575  0 5057 0  TC  CHANG1
A5416
A54161
5417  REP  2  LAST  507  23,2576  3 2407 0  V82REDSP CAP  V16N44
5418  REP 103  LAST  507  23,2577  0 4555 0  TC  BANKCALL
5419  REP 11  LAST  507  23,2600  20465 1  CADR  GOXDSPP
5420  REP  5  LAST  507  23,2601  0 5514 1  TC  B5OFF
5421  REP  6  LAST  510  23,2602  0 5514 1  TC  B5OFF
5422  REP  1      23,2603  0 2576 1  TC  V82REDSP

5423  REP  61  LAST  508  23,2604  0 6006 1  V82GQN1 TC  INTPRET
A5424
5425      23,2605  52175 0  VLOAD  GOTO
5426  REP  6  LAST  500  23,2606  01171 1  RN
5427  REP  1      23,2607  46610 1  NEXLINE
5428  REP 11  LAST  507  23,2610  26327 0  NEXLINE
5429  REP  6  LAST  500  23,2611  01177 1  RONE
5430  REP  7  LAST  507  23,2612  02335 0  VN
5431      23,2613  52014 0  STORE  VONE
5432  REP  6  LAST  500  23,2614  04303 0  BQN  GOTO
5433  REP  1      23,2615  46617 0  MOONTHIS
5434  REP  1      23,2616  46630 0  MOONGQN

5435      23,2617  71214 0  MOONGQN SET  DLOAD
5436  REP  3  LAST  506  23,2620  04462 0  V82EMFLG
54361  REP  1      23,2621  06454 1  1/RIMU
5437  REP  2  LAST  507  23,2622  14037 0  STODL  TFF/RTMU
5438  REP  1      23,2623  06460 0  MINPERM
5439  REP  3  LAST  507  23,2624  26321 0  STOV L  HPERMIN
5441  REP  4  LAST  508  23,2625  02028 1  RLS
5443      23,2626  52046 1  ARVAL  GOTO
5444  REP  1      23,2627  46637 1  V82GQN2
5445      23,2630  71214 0  EARTHGQN CLEAR DLOAD
5446  REP  4  LAST  510  23,2631  04662 1  V82EMFLG
54461  REP  2  LAST  507  23,2632  06456 0  1/RTMU
5447  REP  3  LAST  510  23,2633  14037 0  STODL  TFF/RTMU
5448  REP  2  LAST  507  23,2634  06462 1  MINPERE
5449  REP  4  LAST  510  23,2635  16321 0  STODL  HPERMIN
5450  REP  3  LAST  506  23,2636  05311 1  RPAD
5451  REP  3  LAST  508  23,2637  36323 0  V82GQN2 STCALL RPADTEM
5453  REP  2  LAST  508  23,2640  46667 1  SR30.1
```

AVERAGE G QN. USE CURRENT STATE VECTOR
FOR ORBITAL PARAMETER CALCULATIONS.
LESS THAN LAMBERT
V82GQN1 WILL PERFORM ORBIT CALCULATIONS
ABOUT PROPER BODY APPROX ONCE PER SEC.

WITHOLD V16 N44 UNTIL FIRST ORBIT CALC
IS DONE. NOTE' V82GQN1 (PRI07, FINDVAC
JOB) IS COMPLETED BEFORE V82GQN (PRI07,
NOVAC JOB).
MONITOR HAP0, HPER, TFF

TERM THIS TELLS V82GQN1 TO KILL ITSELF.
PROC DITTO.
RECYCLE

THIS EXEC PROGRAM PERPETUATES ITSELF
ONCE A SEC UNTIL BIT 5 OF EXTVBACT =0.
HOLDS OFF CCS NEWJOB BETWEEN RN AND
VN FETCH SO RN , VN ARE FROM SAME
STATE VECTOR UPDATE.

RN AT (-29)M FOR EARTH OR MOON
VN AT (-7)M/CS FOR EARTH OR MOON

FLAG INDICATES BODY ABOUT WHICH ORBITAL
CALCULATIONS ARE TO BE PERFORMED.
IF SET - MOON , IF RESET - EARTH.

INDICATE MOON SCALING FOR SR30.1
LUNAR PARAMETERS LOADED HERE FOR SR30.1

SCALED AT (-27)M.

INDICATE EARTH SCALING FOR SR30.1
EARTH PARAMETERS LOADED HERE FOR SR30.1

COMMON CODE FOR EARTH d MOON.



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5454				23,2641	77776 1	EXIT	
5455	REF	9	LAST	417	23,2642 0 5253 0	TC	CHECKOM
5456					23,2643 00013 0	DEC	11
5457	REF	1			23,2644 0 2857 1	TC	V62GON3
5458	REF	62	LAST	510	23,2645 0 6008 1	TC	INTPRET
54581					23,2646 77624 1	CALL	
54582	REF	13	LAST	503	23,2647 27371 1		INTSTALL
5459					23,2650 45145 0	DLOAD	CALL
5460	REF	12	LAST	510	23,2651 02344 0	TPP	
5461	REF	1			23,2652 64017 0	DELRSP	
5462					23,2653 77776 1	SPLRET	EXIT
54621	REF	10	LAST	506	23,2654 3 1011 0	CA	MODREG
54622					23,2655 0 0008 1	EXTEND	
54623	REF	1			23,2656 1 2501 0	BZF	SPLRET1
5463	REF	26	LAST	509	23,2657 3 4706 1	CAP	BITS
5464	REF	15	LAST	509	23,2660 7 1044 1	MASK	EXTVBACT
5465					23,2661 0 0008 1	EXTEND	
5466	REF	25	LAST	509	23,2662 1 5423 0	BZF	ENDEXT
5468	REF	8	LAST	509	23,2663 3 4734 0	CAP	1SEC
5469	REF	104	LAST	510	23,2664 0 4555 0	TC	BANKCALL
5470	REF	5	LAST	507	23,2665 01732 0	CADR	DELAYJOB
5471	REF	2	LAST	510	23,2666 0 2604 1	TC	V62GON1

NOT IN MODE 11.
IN MODE 11 OR 00

DELRSP DOES INTWAKE

RETURN IS TO NEXT LINE (SPLRET).

SEE IF ASTRONAUT HAS SIGNALLED TERMINATE

YES, TERMINATE VB 82 LOOP

WAIT ONE SECOND BEFORE REPEATING
ORBITAL PARAMETER COMPUTATION.



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P5548 SUBROUTINE NAME' SR30.1
 R5549 MOD NO' 0
 R5551 MOD BY' RR BAIRNSPATHER
 R5553 MOD NO' 1 MOD BY' RR BAIRNSPATHER DATE' 11 APR 67
 R5555 MOD NO' 2 MOD BY' RR BAIRNSPATHER DATE' 14 APR 67
 R5557 MOD NO' 3 MOD BY' ALONSO DATE' 11 DEC 87
 R5558 MOD NO' 4 MOD BY' ALONSO DATE' 26 MAR 68
 R5559 MOD NO' 5 MOD BY' RR BAIRNSPATHER DATE' 6 AUG 88
 R5561
 R5562 NEW FUNCTIONAL DESCRIPTION' ORBITAL PARAMETERS DISPLAY FOR NOUNS 32 AND 44.
 R5584 SR30.1 CALLS: TFFCONMU AND TFFRP/RA TO CALCULATE RPER (PERIGEE RADIUS),
 R5565 RAPO (APOGEE RADIUS), HPER (PERIGEE HEIGHT ABOVE LAUNCH PAD OR LUNAR
 R5566 LANDING SITE), HAPO (APOGEE HEIGHT AS ABOVE), TPER (TIME TO PERIGEE),
 R5567 TFF (TIME TO INTERSECT 300 KFT ABOVE PAD OR 35KFT ABOVE LANDING SITE).
 R5568 IF HPER IS GREATER THAN OR EQUAL TO HPERMIN, CALCULATES TPER AND STORES
 R5569 NEGATIVE IN -TPER. OTHERWISE STORES +0 IN -TPER. WHENEVER TPER IS
 R5570 CALCULATED, TFF IS NOT COMPUTABLE AND DEFAULTS TO -58MIN 59SEC. IF HAPO
 R5571 WOULD EXCEED 9999.9 NM, IT IS LIMITED TO THAT VALUE FOR DISPLAY.
 R5572 ADDENDUM' HAPO AND HPER SHOULD BE CHANGED TO READ HAPOX AND HPERX IN THE
 R5573 ABOVE REMARKS.
 R5574 CALLING SEQUENCE' CALL
 R5575 SR30.1
 R5576 SUBROUTINES CALLED' TFFCONMU, TFFRP/RA, CALCTPER, CALCTFF
 R5577 NORMAL EXIT MODE' CALLING LINE +1 (STILL IN INTERPRETIVE MODE)
 R5578 ALARMS' NONE
 R5579 OUTPUT' RAPO (-29) M EARTH APOGEE RADIUS EARTH CENTERED COORD.
 R5580 (-27) M MOON MOON CENTERED COORD.
 R5581 RPER (-29) M EARTH PERIGEE RADIUS EARTH CENTERED COORD.
 R5582 (-27) M MOON MOON CENTERED COORD.
 R5583 HAPOX (-29) M APOGEE ALTITUDE ABOVE PAD OR LAND. SITE MAX VALUE LIMITED TO 9999.9 NM.
 R5585 HPERX (-29) M PERIGEE ALT. ABOVE PAD OR LAND. SITE MAX VALUE LIMITED TO 9999.9 NM.
 R5587 TFF (-28) CS TIME TO 300KFT OR 35KFT ALTITUDE
 R5588 -TPER (-28) CS TIME TO PERIGEE
 R5589 ERASABLE INITIALIZATION REQUIRED-
 R5590 TFF/RIMU (+17) EARTH RECIPROCAL OF PROPER GRAV CONSTANT FOR
 R5591 (+14) MOON EARTH OR MOON = 1/SQRT(MU).
 R5592 RONE (-29) M STATE VECTOR
 R5593 VONE (-7) M/CS STATE VECTOR
 R5594 RPADTEM (-29) M EARTH RADIUS OF LAUNCH PAD OR LUNAR LANDING
 R5595 (-27) M MOON SITE.
 R5596 HPERMIN (-29) M EARTH (300 OR 35)KFT MINIMUM PERIGEE ALTITUDE
 R5597 (-27) M MOON ABOVE LAUNCH PAD OR LUNAR LANDING SITE.
 R5598 V82EMPLG (INT SW BIT) RESET FOR EARTH, SET FOR MOON.
 R5599 DEBRIS' OPRET, PDL, S2



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						COUNT*	SS/SR30S
5600	REF	1					
5601				23,2667	44001 0	SR30.1	SETPD STO
5602				23,2670	00001 0		0
5603	REF	4	LAST	442	23,2671	00051 0	S2
A5604							
A5605							
A5606							
A5607							
A5608							
A5609							
A5610							
A5611							
A5612							
A5613							
5614				23,2672	77214 0	BOFF	VLOAD
5615	REF	5	LAST	510	23,2673	04742 1	V82EMFLG
5616	REF	1			23,2674	46703 1	TFFCALLS
5617	REF	12	LAST	510	23,2675	02327 0	RONE
5618					23,2676	77752 1	VSL-2
5619	REF	13	LAST	513	23,2677	26327 0	STOVL
5620	REF	6	LAST	510	23,2700	02335 0	RONE
5621					23,2701	77752 1	VONE
5622	REF	9	LAST	513	23,2702	02335 0	VSL-2
5623					23,2703	77624 1	STORE
5624	REF	1			23,2704	56751 1	TFFCALLS CALL
5625					23,2705	77624 1	TPPQNMU
5626	REF	1			23,2706	57017 0	CALL
A5627							TPFRP/RA
5628					23,2707	77625 0	DSU
5629	REF	4	LAST	510	23,2710	02323 1	RPADTEM
5630					23,2711	64414 1	BOFF
A5631							SR2R
A5632							
5633	REF	6	LAST	513	23,2712	04742 1	V82EMFLG
5634					23,2713	46714 1	+1
5635					23,2714	77624 1	CALL
5636	REF	1			23,2715	46754 0	MAXCHK
5637	REF	4	LAST	506	23,2716	16352 1	STORHAPO STOVL
5638	REF	1			23,2717	00017 1	HAPOX
5639					23,2720	77625 0	RPER
5640	REF	5	LAST	513	23,2721	02323 1	DSU
5641	REF	236	LAST	494	23,2722	00161 1	RPADTEM
5642					23,2723	64414 1	STORE
A5643							MPAC +4
A5644							BOFF
5645	REF	7	LAST	513	23,2724	04742 1	SR2R
5646					23,2725	46726 0	V82EMFLG
5647					23,2726	77624 1	+1
5648	REF	2	LAST	513	23,2727	46754 0	CALL
							MAXCHK

INITIALIZE PUSHDOWN LIST.

SR30.1 INPUT' RONE AT (-29)M EARTH/MOON
VONE AT (-7)M/CS
TPPQNMU, TPFRP/RA, CALCTPR AND CALCTFF
CALLS REQUIRE '
EARTH CENTERED (NO RESCALING REQUIRED)
RONE SCALED TO B-29 M
VONE SCALED TO B-7 M/CS
MOON CENTERED (RESCALING REQUIRED)
RONE SCALED TO B-27 M
VONE SCALED TO B-5 M/CS

OFF FOR EARTH , ON FOR MOON.

TPFRP/RA COMPUTES RAPO, RPER.
RETURNS WITH RAPO IN D(MPAC).

NEED HAPO AT (-29)M FOR DISPLAY.
IF MOON CENTERED, RESCALE FROM (-27)M.
IF EARTH CENTERED ALREADY AT (-29)M.
OFF FOR EARTH , ON FOR MOON.

IF HAPO < MAXNM, SET HAPO = 9999.9 NM.
OTHERWISE STORE (RAPO-RPADTEM) IN HAPO.

GIVES HPER AT (-29)M EARTH, (-27)M MOON.
SAVE THIS FOR COMPARISON TO HPERMIN.
NEED HPER AT (-29)M FOR DISPLAY.
IF MOON CENTERED, RESCALE FROM (-27)M.
IF EARTH CENTERED ALREADY AT (-29)M.
OFF FOR EARTH , ON FOR MOON.

IF HPER < MAXNM, SET HPER = 9999.9 NM.



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5649	REP	4	LAST	275	23,2730	16354	1	STORE	HPER	STOOL	HPERX
5650	REP	239	LAST	513	23,2731	00161	1				MPAC +4
5651					23,2732	51025	1		DSU		BPL
5652	REP	5	LAST	510	23,2733	02321	0				HPERMIN
5653	REP	1			23,2734	46740	0				DOTPER
5654					23,2735	52145	0		DLOAD		GOTO
5655	REP	1			23,2738	15332	1				HI6ZEROS
5656	REP	1			23,2737	46744	1				SKIPTPER
5657					23,2740	45145	0		DOTPER	DLOAD	CALL
5658	REP	2	LAST	513	23,2741	00017	1				RPER
5659	REP	1			23,2742	57055	0				CALCTPER
5660					23,2743	77676	0			DCOMP	
5661	REP	7	LAST	509	23,2744	16346	1		SKIPTPER	STOOL	-TPER
5662	REP	6	LAST	514	23,2745	02321	0				HPERMIN
5663					23,2746	45015	1		DAD		CALL
5664	REP	6	LAST	513	23,2747	02323	1				RPADTEM
5665	REP	1			23,2750	57080	0				CALCTPP
5666					23,2751	77676	0		DCOMP		
5637	REP	13	LAST	511	23,2752	36344	1		STCALL	TPP	
5666	REP	5	LAST	513	23,2753	00051	0			S2	
5669					23,2754	51025	1	MAXCHK	DSU	BPL	
5670	REP	1			23,2755	06764	1			MAXNM	
5671					23,2756	46761	0			+3	
5672					23,2757	43415	0		DAD	RVO	
5673	REP	2	LAST	514	23,2760	06764	1			MAXNM	
5674					23,2761	43545	1	+3	DLOAD	RVO	
5675	REP	3	LAST	514	23,2762	06764	1			MAXNM	
5676					23,2763	01065	0	MAXNM	2OCT	01065	05603
5676					23,2764	05603	1				

STORE (RPER - RPADTEM) INTO HPERX.

HPERMIN AT (-29)M FOR EARTH, (-27)M MOON
IF HPER L/ HPERMIN (300 OR 35)KPT,
THEN ZERO INTO -TPER.
OTHERWISE CALCULATE TPER.

TPER IS PUT NEG INTO -TPER.

HPERMIN AT (-29)M FOR EARTH, (-27)M MOON

RPADTEM AT (-29)M FOR EARTH, (-27)M MOON
GIVES 59*59S FOR TPP IF RPER G/
HPERMIN + RPADTEM. (TPER WAS NON ZERO)
OTHERWISE COMPUTES TPP. (GOTO)

IF C(MPAC) \leq 9999.9 NM, MPAC = 9999.9 NM

OTHERWISE C(MPAC) = R(MPAC).

(USED BY P30 - P37 ALSO)



ASSEMBLE REVISION 249 OF AGC PROGRAM COLOSSUS BY NASA 2021111-041

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L R30

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L STABLE ORBIT - P38-P39

USER'S PAGE NO. 1 E0 S3

R0001 STABLE ORBIT RENDEZVOUS PROGRAMS (P38 AND P78)

R0002 MOD NO -1 LOG SECTION - STABLE ORBIT - P38-P39

R0003 MOD BY RUDNICKI,S DATE 25JAN68

R0004 FUNCTIONAL DESCRIPTION

R0005 P38 AND P78 CALCULATE THE REQUIRED DELTA V AND OTHER INITIAL
R0006 CONDITIONS REQUIRED BY THE AGC TO (1) PUT THE ACTIVE VEHICLE
R0007 ON A TRANSFER TRAJECTORY THAT INTERCEPTS THE PASSIVE VEHICLE
R0008 ORBIT A GIVEN DISTANCE, DELTA R, EITHER AHEAD OF OR BEHIND THE
R0009 PASSIVE VEHICLE AND (2) ACTUALLY PLACE THE ACTIVE VEHICLE IN THE
R0010 PASSIVE VEHICLE ORBIT WITH A DELTA R SEPARATION BETWEEN THE TWO
R0011 VEHICLES

R0012 CALLING SEQUENCE

R0013 ASTRONAUT REQUEST THRU DSKY

R0014 V37E38E IF THIS VEHICLE IS ACTIVE VEHICLE

R0015 V37E70E IF OTHER VEHICLE IS ACTIVE VEHICLE

R0016 INPUT

R0017 (1) SOI MANEUVER

R0018 (A) TIG TIME OF SOI MANEUVER
R0019 (B) CENTANG ORBITAL CENTRAL ANGLE OF THE PASSIVE VEHICLE
R0020 DURING TRANSFER FROM TIG TO TIME OF INTERCEPT
R0021 (C) DELTAR THE DESIRED SEPARATION OF THE TWO VEHICLES
R0022 SPECIFIED AS A DISTANCE ALONG THE PASSIVE VEHICLE
R0023 ORBIT
R0024 (D) OPTION EQUALS 1 FOR SOI

R0025 (2) SOR MANEUVER

R0026 (A) TIG TIME OF SOR MANEUVER
R0027 (B) CENTANG AN OPTIONAL RESPECIFICATION OF 1 (B) ABOVE
R0028 (C) OPTION EQUALS 2 FOR SOR
R0029 (D) DELTTIME THE TIME REQUIRED TO TRAVERSE DELTA R WHEN
R0030 TRAVELING AT A VELOCITY EQUAL TO THE HORIZONTAL
R0031 VELOCITY OF THE PASSIVE VEHICLE - SAVED FROM
R0032 SOI PHASE
R0033 (E) TINT TIME OF INTERCEPT (SOI) - SAVED FROM SOI PHASE

R0034 OUTPUT

R0035 (1) TRGMKONT NUMBER OF MARKS

R0036 (2) TTGOGO TIME TO GO

R0037 (3) +MGA MIDDLE GIMBAL ANGLE



L STABLE ORBIT - P36-P39

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R0036 (4) DSPTM1 TIME OF INTERCEPT OF PASSIVE VEHICLE ORBIT
R0039 (FOR SOI ONLY)
R0040 (5) POSTTPI PERIGEE ALTITUDE OF ACTIVE VEHICLE ORBIT AFTER
R0041 THE SOI (SOR) MANEUVER
R0042 (6) DELVTPI MAGNITUDE OF DELTA V AT SOI (SOR) TIME
R0043 (7) DELVTPI MAGNITUDE OF DELTA V AT INTERCEPT TIME
R0044 (8) DELVLVC DELTA VELOCITY AT SOI (AND SOR) - LOCAL VERTICAL
R0045 COORDINATES

R0048 SUBROUTINES USED

R0047 AVPLAGA
R0048 AVPLAGP
R0049 VNDSPLY
R0050 BANKCALL
R00502 GOFPLASHR
R00504 GOTOPOOH
R00508 BLANKET
R00508 ENDOPJOB
R0051 PREC/TT
R0052 SELECTMU
R0053 INTRPVP
R0054 MAINRINE

0055				04,3103			BANK 04
0058	REF	1		04,2000			SETLOC STBLEORB
0057				04,3103			BANK
0058	REF	13	LAST	498	E4,1770		ERANK= SUBEXIT
0059	REF	1					COUNT* 55/P3879
0060	REF	105	LAST	511	04,3103	0 4555 0	P38 TC BANKCALL
0081	REF	3	LAST	480	04,3104	73728 0	CADR AVPLAGA
0062					04,3105	0 3110 1	TC +3
0063	REF	106	LAST	517	04,3106	0 4555 0	P78 TC BANKCALL
0064	REF	3	LAST	480	04,3107	73741 1	CADR AVPLAGP
00645	REF	107	LAST	517	04,3110	0 4555 0	TC BANKCALL
00646	REF	3	LAST	480	04,3111	73748 0	CADR P20FLGON
0085	REF	1			04,3112	3 3440 1	CAP V08N33SR
0066	REF	1			04,3113	0 3427 0	TC VNDSPLY
0087	REF	1			04,3114	3 3441 0	CAP V08N55SR
0066	REF	106	LAST	517	04,3115	0 4555 0	TCR BANKCALL
0069	REF	2	LAST	475	04,3116	20763 1	CADR GOFPLASHR
00894	REF	13	LAST	504	04,3117	1 4106 0	TCF GOTOPOOH
00696					04,3120	1 3125 0	TCF +5
00698					04,3121	1 3114 1	TCF -5
0070	REF	16	LAST	509	04,3122	3 6214 0	CAP THREE
00702	REF	2	LAST	475	04,3123	0 5415 1	TCR BLANKET
00704	REF	61	LAST	509	04,3124	1 5112 1	TCF ENDOPJOB
0071	REF	6	LAST	418	04,3125	3 4715 0	CAP FIVE

THIS VEHICLE ACTIVE

OTHER VEHICLE ACTIVE

SET UPDATAFLG, TRACKFLG
DISPLAY TIG

DISPLAY CENTANG

TERMINATE

PROCEED

RECYCLE

IMMEDIATE RETURN - BLANK R1, R2

L STABLE ORBIT - P38-P39

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0072	REP	2	LAST	288	04,3128	554131 1
0073	REP	64	LAST	507	04,3127	3 4712 1
0074	REP	4	LAST	450	04,3130	554132 1
00742	REP	1			04,3131	3 3442 0
00744	REP	109	LAST	517	04,3132	0 4555 0
00748	REP	3	LAST	517	04,3133	20783 1
00748	REP	14	LAST	517	04,3134	1 4108 0
0075					04,3135	1 3142 1
00752					04,3138	1 3131 0
0078	REP	18	LAST	389	04,3137	3 4710 0
0077	REP	3	LAST	517	04,3140	0 5415 1
0078	REP	62	LAST	517	04,3141	1 5112 1
0079	REP	83	LAST	511	04,3142	0 8008 1
0080					04,3143	70535 0
0081	REP	5	LAST	518	04,3144	01133 1
0082					04,3145	71230 0
0083	REP	1			04,3148	11154 1
0084	REP	1			04,3147	03858 1
0085	REP	1			04,3150	02811 0
0086					04,3151	77814 1
0087	REP	1			04,3152	01230 1

TS	OPTION1
CAP	ONE
TS	OPTION2
CAP	V04N08SR
TCR	BANKCALL
CADR	GOFASHR
TCP	GOTOPOCH
TCP	+5
TCP	-5
CAP	BIT3
TCR	BLANKET
TCP	ENDOFJOB
TC	INTPRET
SLOAD	SR1
BHIZ	OPTION2
	DLOAD
	OPTN1
	TINT
STORE	TINTSOI
CLRG0	
	OPTNSW

OPTION CODE IS SET TO 1
 DISPLAY OPTION CODE - 1 = SOI, 2 = SOR

TERMINATE
 PROCEED
 RECYCLE
 IMMEDIATE RETURN - BLANK R3

STORE FOR SOR PHASE

OPTNSW

518-A

0086	REF	1		04,3153	11203 0		JUNCTN1	
0089				04,3154	43014 0	OPTN1	SET	CLEAR
00895	REF	2	LAST 516	04,3155	01070 1			SOI
0090	REF	4	LAST 474	04,3156	00670 0			OPTNSW
00905				04,3157	77824 1		CALL	UPDATFLG
0091	REF	1		04,3160	11362 0			PREC/TT
00915				04,3161	43214 1		SET	DAD
0092	REF	5	LAST 516	04,3162	00470 1			UPDATFLG
0093	REF	23	LAST 503	04,3163	03413 1			TIG
0094	REF	2	LAST 516	04,3164	03656 1		STORE	TINT
0095	REF	31	LAST 451	04,3165	01046 1		STORE	DSPTM1
0096				04,3166	77776 1		EXIT	
00962	REF	1		04,3167	3 3443 1		CAF	V06N57SR
00964	REF	110	LAST 516	04,3170	0 4555 0		TCR	RANKCALL
00966	REF	4	LAST 518	04,3171	20763 1		CADR	GOPLASHR
00966	REF	15	LAST 518	04,3172	1 4106 0		TCF	GOTOPOCH
0097				04,3173	1 3200 1		TCF	+5
00972				04,3174	1 3167 0		TCF	-5
0096	REF	16	LAST 501	04,3175	3 6211 0		CAF	SIX
0099	REF	4	LAST 516	04,3176	0 5415 1		TCR	BLANKET
0100	REF	63	LAST 516	04,3177	1 5112 1		TCF	ENDOFJOB
0101	REF	1		04,3200	3 3444 0		CAF	V06N34SR
0102	REF	2	LAST 517	04,3201	0 3427 0		TC	VNDSPLY
0103	REF	64	LAST 516	04,3202	0 8006 1		TC	INTPRET
0104				04,3203	45014 0	JUNCTN1	CLEAR	CALL
0105	REF	1		04,3204	04266 1			P39/79SW
0106	REF	3	LAST 460	04,3205	10718 0			SELECTMU
0107				04,3208	77624 1	RECYCLE	CALL	
0108	REF	2	LAST 516	04,3207	11362 0			PREC/TT

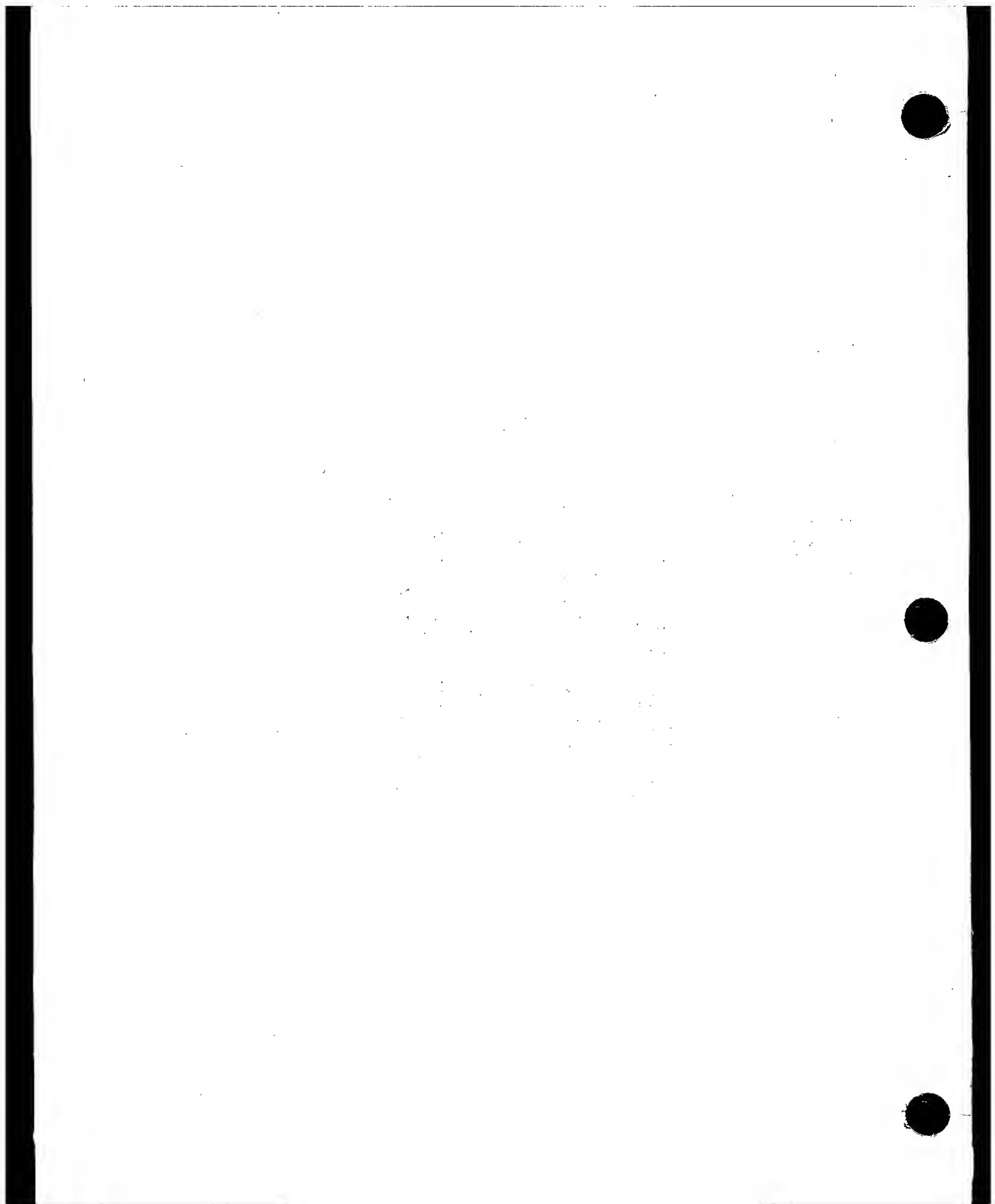
TI = TIG + TF
FOR DISPLAY

DISPLAY DELTA R

TERMINATE
PROCEED
RECYCLE
IMMEDIATE RETURN - BLANK R2, R3

DISPLAY TIME OF INTERCEPT

SELECT MU, CLEAR FINALFLG, GO TO VN1645





L STABLE ORBIT - P38-P39

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0109				04,3210	71214 0	BOFF	DLOAD		
0110	REF	3	LAST	518	04,3211	01350 0		OPTNSW	
0111	REF	1			04,3212	11232 1		OPTN2	
0112	REF	3	LAST	518	04,3213	03858 1		TINT	
0113	REF	18	LAST	507	04,3214	34041 0	STCALL	TDEC1	PRECISION UPDATE PASSIVE VEHICLE TO
0114	REF	1			04,3215	11413 1		INTRPVP	INTERCEPT TIME
0115					04,3216	53575 0	VLOAD	UNIT	
0116	REF	14	LAST	507	04,3217	00001 0		RATT	RP/(RP)
0117					04,3220	47315 0	PDVL	VXV	
0118	REF	11	LAST	507	04,3221	00007 0		VATT	
0119					04,3222	60248 1	ABVAL	NORM	(VP X RP/(RP))
0120	REF	7	LAST	501	04,3223	00047 1		X1	
0121					04,3224	58325 0	PDOL	DDV	
0122	REF	5	LAST	275	04,3225	02811 0		DELTA R	
0123					04,3226	77857 0	SL*		DELTA R / (VP X RP/RP)
0124					04,3227	20172 1		0 -T,1	
0125	REF	1			04,3230	38613 0	STCALL	DELTIME	DELTA T = (RP) DELTA R / (VP X RP)
0126	REF	1			04,3231	11238 0		JUNCTN2	
0127					04,3232	43345 1	OPTN2	DLOAD	
0128	REF	2	LAST	518	04,3233	02811 0		DAD	
0129	REF	2	LAST	457	04,3234	00037 0		TINTSOI	
0130	REF	4	LAST	519	04,3235	03858 1		T	
0131					04,3236	45345 1	JUNCTN2	STORE TINT	TI = TI + TP
0132	REF	5	LAST	519	04,3237	03858 1		DSU	
0133	REF	2	LAST	519	04,3240	02813 1		TINT	
0134	REF	1			04,3241	02815 1		DELTIME	
R0135	....	MAINRINE	....				STORE	TARGETIME	TT = TI - DELTA T
R0136		SUBROUTINES USED							
R0137		S3435.25							
R0138		PERIAPO1							
R0139		SHIPTR1							
R0140		VNDSPY							
R0141		BANKCALL							
R0142		GOFLASH							
R0143		GOTOPOCH							
R0145		VN1845							
0146	REF	19	LAST	519	04,3242	34041 0	MAINRINE	STCALL	TDEC1
0147	REF	2	LAST	519	04,3243	11413 1		INTRPVP	PRECISION UPDATE PASSIVE VEHICLE TO
0148					04,3244	77745 1	DLOAD		TARGET TIME
0149	REF	24	LAST	518	04,3245	03413 1		TIG	
0150	REF	7	LAST	482	04,3246	03503 1	STORE	INTIME	
0151					04,3247	77331 0	SSP	VLOAD	
0152	REF	14	LAST	517	04,3250	02371 0		SUBEXIT	
0153	REF	1			04,3251	11255 0		TEST3979	
0154	REF	15	LAST	519	04,3252	00001 0		RATT	
0155					04,3253	77824 1	CALL		
0156	REF	1			04,3254	72547 1		S3435.25	
0157					04,3255	43014 0	TEST3979	BOFF	BON

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REF	REP	LAST	516	04,3256	04348 1	P39/79SW		
0159	REP	1		04,3257	11268 0	MAINRTRN1		
0160	REP	5	LAST	468	04,3260	01311 0	FINALPLG	
0161	REP	1			04,3261	11264 1	P39P79	
0162					04,3262	77814 1	SET	
0163	REP	6	LAST	516	04,3263	00470 1	UPDATPLG	
0164					04,3264	77776 1	P39P79	
01645	REP	1			04,3265	0 3313 0	EXIT	
0165					04,3266	51575 1	TC	FOR P39 AND P79
0166	REP	12	LAST	463	04,3267	03648 0	MAINRTRN1	
0167	REP	5	LAST	457	04,3270	28635 0	VLOAD	DSPLY61
0168	REP	4	LAST	467	04,3271	03640 0	STOVL	DELVEET3
0169					04,3272	51451 0		DELVTPI
0170	REP	7	LAST	463	04,3273	03620 0		DELTA V
0171	REP	5	LAST	457	04,3274	28637 1		
0172	REP	16	LAST	490	04,3275	03540 0		
0173					04,3276	45115 0		
0174	REP	9	LAST	463	04,3277	03612 1		
0175	REP	2	LAST	457	04,3300	45312 0		
0176					04,3301	77824 1		
0177	REP	2	LAST	457	04,3302	45422 1		
0178	REP	3	LAST	457	04,3303	02841 0		
0179					04,3304	43014 0		
0180	REP	6	LAST	520	04,3305	01311 0		
0181	REP	1			04,3306	11310 0		
0182	REP	7	LAST	520	04,3307	00470 1		
0183					04,3310	77776 1		
0184	REP	1			04,3311	3 3445 1		
0185	REP	3	LAST	516	04,3312	0 3427 0		
0186	REP	1			04,3313	3 3448 1		
0187	REP	4	LAST	520	04,3314	0 3427 0		
0188	REP	65	LAST	516	04,3315	0 6006 1		
0189					04,3316	77214 0		
0204	REP	2	LAST	472	04,3317	01287 0		
0205	REP	13	LAST	520	04,3320	03648 0		
0206	REP	5	LAST	473	04,3321	37846 1		
0207	REP	4	LAST	468	04,3322	73005 0		
0208					04,3323	52014 0		
0209	REP	3	LAST	520	04,3324	04306 0		
0210	REP	1			04,3325	11347 1		
0211	REP	1			04,3326	11206 0		
R0212	STABLE ORBIT MIDCOURSE PROGRAM (P39 AND P79)							
R0213	MOD NO -1 LOG SECTION - STABLE ORBIT - P36-P39							
R0214	MOD BY RUONICKI.5 DATE 25JAN68							
R0215	FUNCTIONAL DESCRIPTION							
R0216	P39 AND P79 CALCULATE THE REQUIRED DELTA V AND OTHER INITIAL							
R0217	CONDITIONS REQUIRED BY THE AGC TO MAKE A MIDCOURSE CORRECTION							



L STABLE ORBIT - P36-P39

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R0216 MANEUVER AFTER COMPLETING THE SOI MANEUVER BUT BEFORE MAKING
R0219 THE SOR MANEUVER

R0220 CALLING SEQUENCE

R0221 ASTRONAUT REQUEST THRU DSKY

R0222 V37E39E IF THIS VEHICLE IS ACTIVE VEHICLE

R0223 V37E79E IF OTHER VEHICLE IS ACTIVE VEHICLE

R0224 INPUT

R0225 (1) TPASS4 TIME OF INTERCEPT - SAVED FROM P36/P76

R0226 (2) TARTIME TIME THAT PASSIVE VEHICLE IS AT INTERCEPT POINT -

R0227 SAVED FROM P36/P76

R0228 OUTPUT

R0229 (1) TRMKONT NUMBER OF MARKS

R0230 (2) TTOGO TIME TO GO

R0231 (3) ANGA MIDDLE GIMBAL ANGLE

R0232 (4) DELVLVC DELTA VELOCITY AT MID - LOCAL VERTICAL COORDINATES

R0233 SUBROUTINES USED

R0234 AVFLAGA

R0235 AVFLAGP

R0236 LOADTIME

R0237 SELECTMU

R0238 PRECSET

R0239 S34/35.1

R0240 MAINRTNE

0241	REF	111	LAST	516	04,3327	0 4555 0	P39	TC	BANKCALL	
0242	REF	4	LAST	517	04,3330	73726 0		CADR	AVFLAGA	THIS VEHICLE ACTIVE
0243					04,3331	0 0006 1		EXTEND		
0244	REF	2	LAST	460	04,3332	3 1422 1		DCA	ATIGINC	
0245	REF	1			04,3333	0 3340 0		TC	P39/P79A	
0246	REF	112	LAST	521	04,3334	0 4555 0	P79	TC	BANKCALL	
0247	REF	4	LAST	517	04,3335	73741 1		CADR	AVFLAGP	OTHER VEHICLE ACTIVE
0248					04,3336	0 0006 1		EXTEND		
0249	REF	2	LAST	460	04,3337	3 1424 1		DCA	PTIGINC	
0250	REF	9	LAST	460	04,3340	53-764 1	P39/P79A	DXCH	KT	TIME TO PREPARE FOR BURN
02505	REF	113	LAST	521	04,3341	0 4555 0		TC	BANKCALL	
02506	REF	4	LAST	517	04,3342	73746 0		CADR	P20FLAGN	SET UPDATFLG, TRACKFLG
0251	REF	66	LAST	520	04,3343	0 6006 1		TC	INTPRET	
0255					04,3344	45014 0		SET	CALL	
02555	REF	4	LAST	520	04,3345	04066 0			P39/79SW	
0256	REF	4	LAST	516	04,3346	10716 0			SELECTMU	SELECT MU, CLEAR FINALFLG, GO TO VN1645
0257					04,3347	43234 0	P39/P79B	RTB	DAD	



L STABLE ORBIT - P38-P39

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0258 REP 9 LAST 508 04,3350 45505 0
0259 REP 10 LAST 521 04,3351 02384 1
02595 REP 25 LAST 519 04,3352 03413 1
0260 REP 20 LAST 519 04,3353 34041 0
0261 REP 3 LAST 480 04,3354 45354 1
0262 04,3355 77624 1
0263 REP 3 LAST 481 04,3356 72522 1
0264 04,3357 52145 0
0265 REP 2 LAST 519 04,3380 02615 1
0266 REP 1 04,3381 11242 0

LOADTIME
KT

STORE TIG
STCALL TDEC1
PRECSET
CALL
S34/35.1
DLOAD GOTO
TARGTIME
MAINRINE

TIG = T (PRESENT) + PREPARATION TIME
PRECISION UPDATE ACTIVE AND PASSIVE
VEHICLES TO TIG

GET UNIT NORMAL

CALCULATE DELTA V AND DELTA V (LV)

R0272 PREC/TT
R0273 SUBROUTINES USED

R0274 PRECSET
R0275 TIMETHET
R0276 S34/35.1

0277 04,3362 71220 1
0278 REP 6 LAST 478 04,3363 02387 1
0279 REP 26 LAST 522 04,3364 03413 1
0280 REP 21 LAST 522 04,3365 34041 0
0281 REP 4 LAST 522 04,3366 45354 1
0282 04,3367 53775 1
0283 REP 8 LAST 490 04,3370 03554 0
0284 04,3371 57178 0
0285 REP 3 LAST 486 04,3372 18657 1
0286 REP 5 LAST 458 04,3373 03754 1
0287 04,3374 71408 0
0288 REP 3 LAST 458 04,3375 18734 0
0289 04,3376 43158 1
0290 REP 2 LAST 458 04,3377 03468 0
0291 REP 3 LAST 458 04,3400 28732 0
0292 REP 6 LAST 490 04,3401 03582 0
0293 04,3402 77657 0
0294 04,3403 57178 0
0295 REP 5 LAST 486 04,3404 38746 1
0296 REP 2 LAST 458 04,3405 24737 1
0297 04,3406 77624 1
0298 REP 4 LAST 522 04,3407 72522 1
0299 04,3410 52145 0
0300 REP 3 LAST 519 04,3411 00037 0
0301 REP 7 LAST 522 04,3412 02367 1

PREC/TT STO DLOAD
RTN
TIG
STCALL TDEC1
PRECSET
VLOAD VSR*
RPASS3
0,2
STOVL RVEC
CENTANG
PUSH COS
STOVL CSH
SIN SET
STOVL RVSW
SNTH
VPASS3
VSR*
0,2
STCALL VVEC
TIMETHET
CALL
S34/35.1
DLOAD GOTO
T
RTN

PRECISION UPDATE ACTIVE AND PASSIVE
VEHICLES TO TIG

GET TRANSFER TIME BASED ON CENTANG OF
PASSIVE VEHICLE

GET UNIT NORMAL

R0302 INTRPVP
R0303 SUBROUTINES USED

R0304 CSMPREC
R0305 LEMPREC

0306 04,3413 43020 1
0307 REP 8 LAST 522 04,3414 02367 1

INTRPVP STO BOFF
RTN

PRECISION UPDATE PASSIVE VEHICLE TO
TDEC1



L STABLE ORBIT - P36-P39

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0308	REF	4	LAST	490	04,3415	01352	1		AVFLAG
0309	REF	1			04,3416	11423	1		OTHERV
0310					04,3417	77624	1	CALL	
0311	REF	3	LAST	490	04,3420	27022	1		CMPREC
0312					04,3421	77650	1	GOTO	
0313	REF	9	LAST	522	04,3422	02367	1		RTRN
0314					04,3423	77624	1	OTHERV CALL	
0315	REF	3	LAST	490	04,3424	27036	1		LEMPREC
0316					04,3425	77650	1	GOTO	
0317	REF	10	LAST	523	04,3426	02367	1		RTRN
R0318	....	VNDSPLY	....					
R0319		SUBROUTINES USED							

R0320 BANKCALL
R0321 GOFLASH
R0322 GOTOPOCH

0323					04,3427	0 0006	1	VNDSPLY	EXTEND	FLASH DISPLAY
0324	REF	11	LAST	523	04,3430	23=767	0	QXCH	RTRN	
0325	REF	4	LAST	476	04,3431	55=765	0	TS	VERBNQUN	
0326	REF	5	LAST	523	04,3432	3 1765	1	CA	VERBNQUN	
0327	REF	114	LAST	521	04,3433	0 4555	0	TCR	BANKCALL	
0328	REF	16	LAST	502	04,3434	20624	0	CADR	GOFLASH	
0329	REF	16	LAST	518	04,3435	1 4106	0	TCF	GOTOPOCH	TERMINATE
0330	REF	12	LAST	523	04,3436	0 1767	0	TC	RTRN	PROCEED
0331					04,3437	1 3432	0	TCF	-5	RECYCLE
0351					04,3440	01441	1	V06N33SR	VN	0633
0352					04,3441	01467	0	V06N55SR	VN	0655
0353					04,3442	01006	0	V04N06SR	VN	0406
0354					04,3443	01471	1	V06N57SR	VN	0657
0355					04,3444	01442	1	V06N34SR	VN	0634
0356					04,3445	01472	1	V06N58SR	VN	0656
0357					04,3446	01521	0	V06N61SR	VN	0661

*** END OF SMOOCH .007 ***

L P11

P0001 EARTH ORBIT INSERTION MONITOR PROGRAM
R0002 *****

R0003 PROGRAM DESCRIPTION -P11-

R0004 MOD NO. 1
R0005 MOD BY ELIASSEN

R0006 FUNCTIONAL DESCRIPTION

R0007 P11 IS INITIATED BY

R0008 A) GYROCOMPASS PRG P02 WHEN LIPTOFF DISCRETE IS RECEIVED OR
R0009 B) BACKUP THRU VERS 75 ENTER

R0010 PROGRAM WILL

R0011 1. ZERO CMC CLOCK AT LIPTOFF (OR UPON RECEIPT OF BACKUP)
R0012 2. UPDATE TEPHEN TO TIME CMC CLOCK WAS ZEROED
R0013 3. INITIATE SERVICER AT PREREAD1
R0014 4. CHANGE MAJOR MODE TO 11
R0015 5. CLEAR DSKY IN CASE OF V 75
R0016 6. STORE LIPTOFF IMU-CDU ANGLES FOR ATT. ERROR DISPLAY
R0017 7. TERMINATE GYROCOMPASSING - -
R0018 8. COMPUTE INITIAL VECTORS RN, VN
R0019 9. COMPUTE REFSMAT FOR PRELAUNCH ALIGNMENT WHERE U, U, U ARE
R0020 - - - X Y Z
R0021 U =UNIT(-R) LOCAL VERTICAL AT TIME OF LIPTOFF
R0022 Z
R0023 - - -
R0024 U =UNIT (A), A=HOR VECTOR AT LAUNCH AZIMUTH
R0025 X
R0026 - - -
R0027 U =U * U
R0028 U Z X

R0029 10. SET REFSMAT KNOWN FLAG
R0030 11. SET AVCEXIT IN SERVICER TO VHDDOT TO
R0031 COMPUTE AND DISPLAY NOUN 62 EVERY 2 SECONDS

R0032 RI V1 - INERTIAL VELOCITY MAGNITUDE IN FPS
R0033 R2 HDOT - RATE OF CHANGE OF VEHICLE VEL IN FPS
R0034 R3 H - VEHICLE ALTITUDE ABOVE PAD IN NM

R0035 12. DISPLAY BODY AXES ATT. ERRORS ON FDAI NEEDLES

R0036 A) FROM L.O. TO RPSTART (APPROX. 0 TO +10SECS AFTER L.O.)
R0037 DESIRED ATTITUDE IS AS STORED AT L.O.
R0038 B) FROM RPSTART TO POLYSTOP (APPROX. +10 TO +133SECS AFTER L.O.)
R0039 DESIRED ATTITUDE IS SPECIFIED BY CMC PITCH AND ROLL
R0040 POLYNOMIALS DURING SATURN ROLLOUT AND PITCHOVER



L P11

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R0041 THE DISPLAY IS RUN AS LOW PRIORITY JOB APPROX.
R0042 EVERY 1/2 SEC OR LESS AND IS DISABLED UPON OVFL0 OF TIME1

R0057 SUBROUTINES CALLED

R0058	2PHSCHNG	BANKCALL	CALCORA	CDUTRIG	CLEANDSP	DANZIG
R00581	DELAYJOB	EARTH	ENDOFJOB	FINDVAC	IBKCALL	
R00582	INTPRET	LALOTRY	NEEDLER	NEWMODEX	PHASCHNG	
R0059	POSTJUMP	POWRSERS	PREHEAD1	REGDSPR	S11.1	
R00591	SERVEXIT	TASKOVER	TCDANZIG	V1ST02S	WAITLIST	

R0060 ASTRONAUT REQUESTS (IF ALTITUDE ABOVE 300,000 FT)

R0061 DSKY -
R0062 MONITOR DISPLAY OF TIME TO PERIGEE R1 HOURS
R0063 R2 MINUTES

R0064 DSKY -
R0065 MONITOR DISPLAY OF R1 APOGEE ALTITUDE IN NAUTICAL MILES
R0066 R2 PERIGEE ALTITUDE IN NAUTICAL MILES
R0067 R3 TFF IN MINUTES/SECS

R0068 IF ASTRONAUT HAS REQUESTED ANY OF THESE DISPLAYS HE MUST
R0069 HIT KEY RELEASE BUTTON TO RETURN TO NORMAL NOUN 62 DISPLAY

R0070 NORMAL EXIT MODE

R0071 ASTRONAUT VERB 37 ENTER 00 ENTER

R0072 ALARM MODES - NONE

R00721 ABORT EXIT MODES -

R00722 EARLY BOOST ABORT FOLLOWED BY REENTRY V 37 E 62 E
R00723 LATE BOOST ABORT FOLLOWED BY REENTRY V 37 E 61 E

R0073 OUTPUT

R0074 TLIFTOFF (DP) TEPHEM (TP)
R0075 REFSMAT
R0076 DSKY DISPLAY
R0077 FDAI DISPLAY

R0078 ERASABLE INITIALIZATION

R0079 AZO, AXO, -AYO
R0080 LATITUDE
R0081 PADLONG
R0082 TEPHEM
R0083 PGNCALT



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R0084 POLYNM THRU POLYNM +14D)

R00841 RPSTART

R00842 POLYSTOP

R0085 FLAGS SET OR RESET

R0086 SET REFSMPLG

R0087 SET DVMON IDLE FLAG

R0088 CLEAR ERADFLAG

R0089 DEBRIS

R0090 LIPTTEMP

R0091 POLYNM THRU POLYNM +7

R0092 SPOLYARG

R0093 BODY1, BODY2, BODY3

R0094 VMAG2, ALTI, HDOT

R0095 CENTRALS, CORE SET AND VAC AREAS

0096	REF	1					COUNT	34/P11
0097	REF	1		4730			BIT55-8	= SUPER011
0098				42,3521			BANK	42
0099	REF	1		34,2000			SETLOC	P11ONE
0100				34,2002			BANK	
0101	REF	6	LAST	213	E3,1706		EBANK=	TEPHEN
0102	REF	2	LAST	184	34,2002	3 4744 1	CA	EBANK3
0103	REF	20	LAST	506	34,2003	54 003 0	TS	EBANK
0104					34,2004	0 0006 1	EXTEND	
0105	REF	1			34,2005	3 2273 0	DCA	REP11S
0106	REF	2	LAST	181	34,2006	52 757 0	DXCH	-PHASE3
01061	REF	111	LAST	509	34,2007	4 4714 0	CS	ZERO
01062					34,2010	22 007 0	ZL	
0107	REF	2	LAST	78	34,2011	55*265 0	TS	LIPTTEMP
0108	REF	2	LAST	181	34,2012	52 763 1	DXCH	-PHASE5
0111					34,2013	0 0006 1	EXTEND	
0112	REF	1			34,2014	3 2275 0	DCA	REP11SA
0113	REF	1			34,2015	53*337 0	DXCH	TLIFTOFF
0114					34,2016	0 0006 1	EXTEND	
0115	REF	13	LAST	406	34,2017	3 0025 0	DCA	TIME2
0116	REF	3	LAST	526	34,2020	53*266 0	DXCH	LIPTTEMP
0117	REF	112	LAST	526	34,2021	3 4714 1	CA	ZERO
0118					34,2022	22 007 0	ZL	
0119	REF	14	LAST	526	34,2023	52 025 1	DXCH	TIME2
0120	REF	2	LAST	526	34,2024	53*337 0	REP11A-2	TLIFTOFF
0121	REF	3	LAST	526	34,2025	52 757 0	REP11A-1	-PHASE3

DIRECT RESTARTS TO REP11

INACTIVE GROUP 5, PRELAUNCH PROTECTION

FOR RESTARTS

RESET PHASE

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0122					34,2026	0 0004 0	REP11A	INHINT		
0123					34,2027	0 0006 1		EXTEND		
0124	REF	7	LAST	526	34,2030	3 1710 0		DCA	TEPHEN	+1
0125	REF	2	LAST	78	34,2031	53=271 0		DXCH	TEPHEN	+1
0126	REF	6	LAST	527	34,2032	3 1706 1		CA	TEPHEN	
0127	REF	3	LAST	527	34,2033	57=267 0		XCH	TEPHEN	
0128					34,2034	0 0006 1		EXTEND		
0129	REF	3	LAST	526	34,2035	3 1337 1		DCA	TLIFTOFF	
0130	REF	4	LAST	527	34,2036	21=271 0		DAS	TEPHEN	+1
0131	REF	5	LAST	527	34,2037	27=267 1		ADS	TEPHEN	
0132	REF	23	LAST	503	34,2040	0 5301 0		TC	PHASONG	
0133					34,2041	05023 0		OCT	05023	
0134					34,2042	22000 1		OCT	22000	
0135					34,2043	0 0004 0		INHINT		
0136					34,2044	0 0006 1		EXTEND		
0137	REF	6	LAST	527	34,2045	3 1270 0		DCA	TEPHEN	
0138	REF	9	LAST	527	34,2046	53=707 1		DXCH	TEPHEN	
0139	REF	7	LAST	527	34,2047	3 1271 1		CA	TEPHEN	+2
0140	REF	10	LAST	527	34,2050	57=710 0		XCH	TEPHEN	+2
0141	REF	1			34,2051	3 2000 0		CAP	ERDVONT	
0142	REF	21	LAST	526	34,2052	54 003 0		TS	ERANK	
01421	REF	10	LAST	212	34,1431			ERANK=	DVONT	
0143	REF	19	LAST	246	34,2053	0 4633 0		TC	IRKCALL	
0144	REF	1			34,2054	76625 1		CADR	PREREAD	
0145	REF	24	LAST	527	34,2055	0 5301 0		TC	PHASONG	
0146					34,2056	05023 0		OCT	05023	
0147					34,2057	22000 1		OCT	22000	
0148	REF	4	LAST	440	34,2060	3 4731 0		CAP	.5 SEC	
0150	REF	20	LAST	509	34,2061	0 5140 1		TC	WAITLIST	
0151	REF	3	LAST	210	34,1704			ERANK=	BODY3	
0152	REF	2	LAST	210	34,2062	02314 0		2CADR	ATERTASK	
0152					34,2063	70066 0				
0153	REF	6	LAST	444	34,2064	0 5243 1		TC	NEWMODEX	
0154					34,2065	00013 0		MM	11	
0155	REF	115	LAST	523	34,2066	0 4555 0		TC	BANKCALL	
0156	REF	3	LAST	447	34,2067	20607 1		CADR	CLEANDSP	
0157	REF	3	LAST	427	34,2070	0 5261 1		TC	2PHSONG	
0158					34,2071	40514 0		OCT	40514	
0159					34,2072	00073 0		OCT	00073	
0160	REF	1			34,2073	3 2001 1		CAP	EROPPLACE	
0161	REF	22	LAST	527	34,2074	54 003 0		TS	ERANK	



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01611 REF 5 LAST 423 E5,1426
016111 REF 1 34,2075 3 2276 0
016112 REF 6 LAST 526 34,2076 55*426 1
0162 34,2077 22 007 0
01621 REF 10 LAST 434 34,2100 3 0032 0
016211 REF 12 LAST 444 34,2101 53*760 0
016212 34,2102 22 007 0
016213 REF 3 LAST 411 34,2103 3 0033 1
016214 REF 2 LAST 93 34,2104 53*762 1
01622 34,2105 22 007 0
016221 REF 7 LAST 411 34,2106 3 0034 0
016222 REF 2 LAST 93 34,2107 53*764 1
016223 REF 67 LAST 521 34,2110 0 6006 1
016224 34,2111 74575 0
016225 REF 13 LAST 526 34,2112 02760 1
016226 REF 14 LAST 526 34,2113 02760 1
0163 34,2114 64375 1
0164 REF 2 LAST 97 34,2115 02467 0
0165 REF 30 LAST 443 34,2116 02672 0
0166 34,2117 53372 1
0167 REF 3 LAST 440 34,2120 02650 0
0168 REF 4 LAST 526 34,2121 16650 0
0169 REF 4 LAST 527 34,2122 01337 1
0170 34,2123 52131 0
0171 REF 6 LAST 514 34,2124 00052 0
0172 REF 1 34,2125 66424 0
0173 REF 2 LAST 423 34,2126 66373 0
0174 REF 66 LAST 526 34,2127 0 6006 1
01741 34,2130 77731 1
01742 REF 10 LAST 492 34,2131 03747 0
01743 34,2132 00000 1
0175 34,2133 65345 0
0176 REF 1 34,2134 01273 0
0177 REF 2 LAST 76 34,2135 01264 0
0178 34,2136 55525 0
0179 REF 6 LAST 445 34,2137 02403 1
0180 REF 6 LAST 276 34,2140 15104 0
0181 REF 2 LAST 514 34,2141 15332 1
0182 34,2142 45014 0
0183 REF 2 LAST 451 34,2143 00662 0
0184 REF 1 34,2144 26373 1

0185 REF 4 LAST 77 34,2145 35232 1
01851 REF 1 34,2146 77256 0
01852 34,2147 77656 1
01853 REF 5 LAST 497 34,2150 25752 0
01854 REF 5 LAST 526 34,2151 01232 0
0186 34,2152 74235 0
0187 REF 5 LAST 269 34,2153 01714 1
0188 REF 1 34,2154 30300 1

EBANK= OPLACES
CA P11XIT
TS OPLACES
ZL
CA CDUX
DXCH OGC
ZL
CA CDUY
DXCH IGC
ZL
CA CDUZ
DXCH MGC
TC INTPRET
VLOAD VSR1
OGC
STORE OGC
VLOAD MXV
THETAN
XSM
VSL1 VAD
ERCOMP
STOVL ERCOMP
TLIFTOPF
SSP GOTO
S2
CADR PROUT
EARTH +3
MATRXJOB TC INTPRET
SSP
RTX2
0
DLOAD PDDL
PGNCSALT
PADLONG
PDDL VDEF
LATITUDE
STOVL LAT
HI6ZEROS
CLEAR CALL
BRADFLAG
LALOTORV
CONVERT TO POSITION VECTOR IN REF.COORDS

STCALL RN1
CALCGRV
UNIT
STOVL REFSMAT +12D
RN1
VXV
UNITW
-EARTHAT
RETURN WITH GRAVITY
IN MPAC
UNITZ = UNIT(GRAV)
SCALED AT 1
V = EARTH RATE X R

SET EXIT FROM PROUT IN EARTH
STORE DP GIMBAL
ANGLES FOR ATTITUDE
ERROR DISPLAY
AFTER L.O.

SCALE OGC B-1

RETURN FROM EARTH

ZERO RTX2
FOR
EARTH

ALTITUDE OF PGNC
LONGITUDE

GEODETIC LATITUDE
LAT, LONG, ALT ARE CONSECUTIVE
TIME = 0



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0169 34,2155 77712 0
0190 REF 2 LAST 77 34,2156 25240 0
0191 REF 6 LAST 526 34,2157 01752 0
0209 34,2160 53435 0
0210 REF 6 LAST 526 34,2161 01714 1
0211 34,2162 47206 0
0212 REF 7 LAST 529 34,2163 01752 0
0213 34,2164 65256 0
0214 REF 5 LAST 447 34,2165 02634 1
0215 34,2166 74346 0
0216 34,2167 77626 0
0217 REF 6 LAST 529 34,2170 62041 0
0218 REF 6 LAST 529 34,2171 02634 1
0219 34,2172 74356 1
0220 34,2173 53455 0
0221 REF 9 LAST 529 34,2174 01736 1
0222 REF 10 LAST 529 34,2175 01736 1

0223 34,2176 53435 0
0224 REF 11 LAST 529 34,2177 01752 0
0225 34,2200 77676 0
0226 REF 12 LAST 529 34,2201 01744 1
02261 34,2202 45345 1
02262 REF 11 LAST 463 34,2203 15330 0
02263 REF 7 LAST 529 34,2204 02634 1
02264 34,2205 65215 1
02265 REF 5 LAST 445 34,2206 02401 0
02266 REF 2 LAST 113 34,2207 03301 0
02267 34,2210 45565 0
02268 REF 3 LAST 529 34,2211 74476 1
0227 34,2212 77414 0
0226 REF 2 LAST 473 34,2213 01462 0

0229 REF 25 LAST 527 34,2214 0 5301 0
0230 34,2215 04023 1

0231 34,2216 0 0006 1
0232 REF 1 34,2217 3 2302 1
0233 REF 1 34,2220 53=223 1

0234 REF 2 LAST 301 34,2221 3 7665 0
0235 REF 9 LAST 436 34,2222 55=074 1

0236 REF 5 LAST 411 E6,1501
0237 REF 8 LAST 253 34,2223 3 4752 0
0238 REF 23 LAST 527 34,2224 54 003 0

0239 34,2225 0 0004 0
0246 REF 113 LAST 526 34,2226 4 4714 0
0247 REF 1 34,2227 55=063 1

VSL4 SCALE TO 2(7) M/CS
STOVL VN1
REFSMAT +12D
VXV UNIT
UNITW (REF3 X UNITW) = EAST
PUSH VXV
REFSMAT +12D (EAST X REF3) = -SOUTH
UNIT PDDL
LAUNCHAZ COS(AZ)*SOUTH
COS VXSC
STADR
STODL REFSMAT TEMPORARY STORAGE
LAUNCHAZ
SIN VXSC SIN(AZ)*EAST
VAD UNIT SIN(AZ)*EAST - COS(AZ)*SOUTH = REF1
REFSMAT
STORE REFSMAT

VXV UNIT (REF1 X REF3) = -REF3
REFSMAT +12D
VCOMP
STORE REFSMAT +6
DLOAD DSJ
DHALF 1/2 REV
LAUNCHAZ
DAD PDDL
AZIMUTH
SATRLRT SET SATRLRT = -SATRLRT IF
STADR (1/2REV -LAUNCHAZ +AZIMUTH) IS NEGATIVE
STORE SATRLRT FOR ROLL CALC IN FDAI ATT. ERROR DISPLAY
SET EXIT SET REFSMAT KNOWN FLAG
REFSMPLG

TC PHASCHG
OCT 04023

EXTEND
DCA P11SCADR
DXCH AVGEXIT SET AVGEXIT

CA PRIO31 2 SECONDS AT 2(+8)
TS 1/PIPADT

EBANK= RCSFLAGS
CA EBANK6
TS EBANK

INHINT
CS ZERO
TS TRASE5 RESTART READACCS 2 SECONDS AFTER LIFTOFF



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0248	REP	10	LAST	430	34,2230	4 0025 1	CS	TIME1
0249	REP	1			34,2231	6 4735 1	AD	2SECS
0250	REP	142	LAST	509	34,2232	10 000 0	CCS	A
0251					34,2233	1 2238 0	TCF	+3
0252					34,2234	1 2238 0	TCF	+2
0253	REP	114	LAST	529	34,2235	3 4714 1	CA	ZERO
0254	REP	65	LAST	518	34,2236	6 4712 1	AD	ONE
0255	REP	21	LAST	527	34,2237	0 5140 1	TC	WAITLIST
0256	REP	14	LAST	212	E6,1861		EBANK=	AOG
0257	REP	1			34,2240	02847 0	2CADR	READACCS
0257	REP	1			34,2241	78088 0		
0258	REP	4	LAST	527	34,2242	0 5281 1	TC	2PHSCHNG
0259					34,2243	00003 1	OCT	00003
0260					34,2244	00025 0	OCT	00025
0261	REP	36	LAST	447	34,2245	0 4574 0	TC	POSTJUMP
0262	REP	2	LAST	211	34,2246	77141 0	CADR	NORMLIZE
0263	REP	11	LAST	527	E3,1708		EBANK=	TEPHEN
0264					34,2247	0 0004 0	INHINT	
0265	REP	1			34,2250	10 783 1	CCS	PHASE5
0266	REP	64	LAST	518	34,2251	0 5112 0	TC	ENDOFJOB
0267	REP	4	LAST	528	34,2252	11-265 0	CCS	LIFTTEMP
0268					34,2253	1 2257 1	TCF	+4
0269					34,2254	1 2257 1	TCF	+3
0270					34,2255	1 2257 1	TCF	+2
0271	REP	1			34,2256	1 2013 0	TCF	P11+7
0272	REP	5	LAST	528	34,2257	4 1338 1	CS	TLIFTOFF
0273					34,2260	0 0008 1	EXTEND	
0274	REP	1			34,2261	6 2287 0	BZMP	ENDREP11
0275	REP	15	LAST	528	34,2262	10 024 0	CCS	TIME2
0276	REP	2	LAST	207	34,2263	1 2021 1	TCF	REP11A -5
0277					34,2264	0 0008 1	EXTEND	
0279	REP	5	LAST	530	34,2265	3 1288 1	DCA	LIFTTEMP
0280	REP	1			34,2266	1 2024 1	TCF	REP11A-2
0281					34,2267	0 0008 1	ENDREP11	EXTEND
0282	REP	2	LAST	528	34,2270	3 2275 0	DCA	REP11SA
0283	REP	1			34,2271	1 2025 0	TCF	REP11A-1
0284					34,2272	77768 0	REP11S	2OCT 77768 00011
0284					34,2273	00011 1		

DO READACCS 2 SECONDS AFTER LIPTOFF

CHECK TO INSURE DT IS POSITIVE
TIME POSITIVE
CANNOT GET HERE
TIME NEGATIVE - SET TO 1
RESTORE TIME - OR MAKE POSITIVE

TURN OFF GROUP 3
PROTECT NORMLIZE AND READACCS

DO NORMLIZE AND ENDOFJOB

TIME2 MUST BE NON-ZERO AT LIPTOFF
T2,T1 NOT YET ZEROED, GO AND DO IT
T2,T1 ZEROED, SET TLIFTOFF



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USERAS PAGE NO. 6 E3 S3

0285 34,2274 77764 1 REP11SA 2OCT 77764 00013
0285 34,2275 00013 0
02851 REF 1 34,2276 02451 0 P11XIT GENADR P11OUT
0286 34,2277 71704 1 -ERTHRAT 2DEC* -7.292115138 E-7 B16* - EARTH RATE AT 2(16)
0286 34,2300 41735 0
0286 REF 4 LAST 527 E6,1704 BRANK= BODY3
0289 REF 1 34,2301 02303 0 P11SCADR 2CADR VHHDOT
0289 REF 1 34,2302 70066 0
0290 REF 5 LAST 531 E6,1704 BRANK= BODY3
R0295 VHHDOT IS EXECUTED EVERY 2 SECONDS TO DISPLAY ON DSKY
R0296 VI INERTIAL VELOCITY MAGNITUDE
R0297 HDOT RATE OF CHANGE OF ALT ABOVE L PAD RADIUS
R0298 H ALTITUDE ABOVE L PAD RADIUS

0299 REF 69 LAST 528 34,2303 0 6006 1 VHHDOT TC INTERPRET
0300 34,2304 77624 1 CALL LOAD VMAGI, ALTI,
0301 REF 1 34,2305 70436 1 S11.1 HDOT FOR DISPLAY
0302 34,2306 77776 1 EXIT
0303 REF 1 34,2307 3 2511 0 CAP V08N82 DISPLAY IN R1 R2 R3
0304 REF 116 LAST 527 34,2310 0 4555 0 TC BANKCALL VI HDOT H
0305 REF 1 34,2311 20621 0 CADR REGDSPR DISPLAY INTERFACE - IMMEDIATE RETURN
0306 REF 117 LAST 531 34,2312 0 4555 0 TC BANKCALL
0307 REF 1 34,2313 77132 1 CADR SERVEXIT END OF P11SERVE CYCLE
0308 REF 1 34,2314 3 4701 0 ATERTASK CAP PRIO1 ESTABLISH JOB TO DISPLAY ATT ERRORS
0309 REF 20 LAST 510 34,2315 0 5042 1 TC FINDVAC COMES HERE AT L.O. + .33 SEC
0310 REF 6 LAST 531 E6,1704 BRANK= BODY3
0311 REF 1 34,2316 02326 1 2CADR ATERJOB
0311 REF 1 34,2317 70066 0
03111 REF 6 LAST 529 34,2320 4 1501 0 CS RCSFLAGS SET BIT3 FOR
03112 REF 17 LAST 516 34,2321 7 4710 1 MASK BIT3 NEEDLER
03113 REF 7 LAST 531 34,2322 27*501 0 ADS RCSFLAGS INITIALIZATION PASS
03114 REF 20 LAST 527 34,2323 0 4633 0 TC IBKCALL AND GO
03115 REF 1 34,2324 42404 1 CADR NEEDLER DO IT
0312 REF 25 LAST 509 34,2325 0 5213 1 TC TASKOVER
R0313 THIS SECTION PROVIDES ATTITUDE ERROR DISPLAYS TO THE FPAI DURING SONE BOOST

A0315 COMPUTE DESIRED PITCH W.R.T. LAUNCH SITE LOCAL VERTICAL.
A0316 $PITCH = -.0000469184026 + .00137571556 * T + .0231502260 * T^2 - .0205929365 * T^3$
A0317 SCALED TO 32 REVOLUTIONS
A0318 IF T_L = TIME FROM LAUNCH IN SECONDS, THEN $T = 100(T_L - 10 \text{ SEC}) / (2 * 14)$
A0319 WHERE $T_L \geq 10 \text{ SEC}$
A0320 $T_L \leq 133 \text{ SEC}$

A0321 COMPUTE DESIRED ROLL WHERE ROLL EQUALS COUNTER-CLOCKWISE ANGLE FROM
A0322 LAUNCHAZ TO -Z(S/C) AS SEEN FROM X(S/C).
A0323 $ROLL = LAUNCHAZ - AZIMUTH - .5 + SATRLRT * T$ IN REV
A0324 $SATRLRT$ = RATE OF ROLL IN REV/CENTI-SEC
A0325 T , IN CENTI-SEC, IS DEFINED AS ABOVE, INCLUSIVE OF TIME RESTRICTIONS



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A0326
A0327FOR SIMPLICITY, LET $P = 2\pi \cdot \text{PITCH}$
 $R = 2\pi \cdot \text{ROLL}$ A0328
A0329
A0330CONSTRUCT THE TRANSFORMATION MATRIX, TSNV, GIVING DESIRED S/C AXES IN
TERMS OF SM COORDINATES. LET THE RESULTING ROWS EQUAL THE VECTORS XDC,
YDC, AND ZDC.A0331
A0332
A0333
$$\begin{matrix} * & (& \sin(P) & 0 & -\cos(P) &) & (XDC) \\ \text{TSNV} = & (-\sin(R)\cos(P) & -\cos(R) & -\sin(R)\sin(P)) & = & (YDC) \\ & (-\cos(R)\cos(P) & \sin(R) & -\cos(R)\sin(P)) & = & (ZDC) \end{matrix}$$
A0334
A0335
A0336
A0337XDC, YDC, ZDC ARE USED AS INPUT TO CALGTA FOR THE EXTRACTION OF THE
EULER SET OF ANGLES WHICH WILL BRING THE SM INTO THE DESIRED
ORIENTATION. THIS EULER SET, OGC, IGC, AND MGC, MAY BE IDENTIFIED
AS THE DESIRED CDU ANGLES.A0338
A0339
A0340
$$\begin{matrix} (XDC) & & (OGC) \\ (YDC) & \text{---} & \text{CALGTA} & \text{---} & (IGC) \\ (ZDC) & & (MGC) \end{matrix}$$
A0341
A0342

DEFINE THE VECTOR DELTACDU.

A0343
A0344
A0345
$$\text{DELTACDU} = \begin{matrix} (OGC) & (CDUX) \\ (IGC) & - (CDUY) \\ (MGC) & (CDUZ) \end{matrix}$$
A0346
A0347COMPUTE ATTITUDE ERRORS, A, WHERE $A = \text{TGSC} \cdot \text{DELTACDU}$ A0348
A0349
A0350
$$\text{TGSC} = \begin{matrix} * & (1 & \sin(CDUZ) & 0 &) & \text{THE GIMBAL ANGLES} \\ (0 & \cos(CDUX)\cos(CDUZ) & \sin(CDUX)) & = & \text{TO SPACECRAFT AXES} \\ (0 & -\sin(CDUX)\cos(CDUZ) & \cos(CDUX)) & \text{CONVERSION MATRIX} \end{matrix}$$
A0351
A0352
A0353
A0354THE ATTITUDE ERRORS, A, ARE STORED ONE HALF SINGLE PRECISION IN
THE REGISTERS AK, AK1, AK2 AS INPUT TO NEEDLER, THE FDAI ATTITUDE
ERROR DISPLAY ROUTINE.

0355	REF	16	LAST	530	34,2326	30 024 1
0356					34,2327	0 0006 1
0357					34,2330	6 2332 1
0358	REF	1			34,2331	1 2424 0
0359	REF	10	LAST	255	34,2332	30 102 1
0360	REF	8	LAST	255	34,2333	7 4105 0
0361					34,2334	0 0006 1
0362	REF	1			34,2335	1 2337 0
0363	REF	1			34,2336	0 2420 0
0364	REF	2	LAST	113	34,2337	4 1702 1
0365	REF	11	LAST	530	34,2340	6 0025 0

ATERJOB	CAE	TIME2
	EXTEND	
	BZNP	+2
	TCF	SATCLEAR
	CAE	FLAGWRD6
	MASK	OCT60000
	EXTEND	
	BZP	ATTDISP
	TC	ATERSET
ATTDISP	CS	RPSTART
	AD	TIME1

CHECK IF MORE THAN
164 SECONDS FROM L.O.
YES - CLEAR ERROR COUNTER + EXIT
CHECK FLAGWRD6
BITS 14 + 15
NO SATURN STICK ON
EXIT - SATURN STICK IN USE
PITCH/ROLL START TIME



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03651				34,2341	0 0006 1	EXTEND		
03652	REF	1		34,2342	6 2504 1	BZAP	NOPLY	IF MINUS THEN ATTITUDE HOLD
0366	REF	240	LAST	514	34,2343	54 154 0	TS	MPAC
0367	REF	2	LAST	113	34,2344	55-707 1	TS	SPOLYARG
0368	REF	2	LAST	113	34,2345	6 1703 1	AD	POLYSTOP
0369				34,2346	0 0006 1	EXTEND		
0370				34,2347	6 2351 1	BZAP	+2	
0371	REF	1		34,2350	1 2416 1	TCF	SATOUT	EXIT IF TIME1 GR THAN (RPSTART-POLYSTOP)
0372	REF	3	LAST	112	34,2351	31-661 1	CAE	POLYNM
0373	REF	60	LAST	509	34,2352	54 001 1	TS	L
0374	REF	1		34,2353	3 2510 1	CAP	COEPPOLY	EVALUATE PITCH POLYNOMIAL
0375	REF	1		34,2354	0 7164 0	TC	POWRSERS	SCALED TO 32 REVOLUTIONS

A0376
A0377THE FOLLOWING PAD LOADED COEFFICIENTS ARE
USED TO COMPUTE THE PITCH POLYNOMIALA03771
A0378
A0379
A0380
A0381
A0382
A0383
A0384
A0385
A0386

----- SUNDISK SI COEPS -----			
POLYNM	FIVE		POLYNOMIAL DEGREE -1
+1	2DEC	-.489184028 E-4	A0
+3	2DEC	.137571556 E-2	A1
+5	2DEC	.231502280 E-1	A2
+7	2DEC	-.205929365 E-1	A3
+9D	2DEC	0	A4
+11D	2DEC	0	A5
+13D	2DEC	0	A6
POLYLOC	=	POLYNM +10D	

0387	REF	115	LAST	530	34,2355	3 4714 1	CA	ZERO	RETURN WITH PITCH(32REV)
0388	REF	3	LAST	296	34,2356	54 163 1	TS	MODE	STORED IN MPAC, MPAC +1
0389	REF	70	LAST	531	34,2357	0 6006 1	TC	INTPRET	
0390					34,2360	54201 0	SETPD	SL	32(PITCH(32REV)) = PITCH(REV)
0391					34,2361	00001 0		0	
0392					34,2362	20206 1		5	
0393					34,2363	77606 1	PUSH		LET P(RAD) = 2*PI*PITCH(REV)
0394					34,2364	77650 1	GOTO		
0395	REF	1			34,2365	76103 1	ATDISP1		AROUND SETLOC
A0396								*	
A0397									

CONSTRUCT SM TO S/C MATRIX, TSW

0398	REF	1			37,2000		SETLOC	P11TWO	
0399					37,2103		BANK		36 IN COL., 34 IN DISK
0400	REF	1					COUNT	36/P11	
0401					37,2103	57546 1	ATDISP1	COS	DCOMP
0402					37,2104	14017 1	STODL	14D	-.5*COS(P)
0403					37,2105	77756 0	SIN		
0404					37,2106	14013 0	STODL	10D	.5*SIN(P)
0405	REF	6	LAST	471	37,2107	15332 1		ZEROVECS	

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0408          37,2110  00015 0          STORE 12D          0

A0407          EVALUATE ROLL = LAUNCHAZ-AZIMUTH-.5+SATRLRT*T
0409          SLOAD DMP
0410 REF 3 LAST 533 37,2112  03310 0          SPOLYAR3      TIME1 - RPSTART ,CSECS B-14.
0411 REF 4 LAST 529 37,2113  03301 0          SATRLRT
0412          SL DSU
0413          14D
0414 REF 12 LAST 529 37,2116  15330 0          DPHALP
0415          DAD DSU          ASSUMING X(SM) ALONG LAUNCH AZIMUTH,
0416 REF 8 LAST 529 37,2120  02834 1          LAUNCHAZ      LAUNCHAZ = ANGLE FROM NORTH TO X(SM).
0417 REF 6 LAST 529 37,2121  02401 0          AZIMUTH      AZIMUTH = -ANGLE FROM NORTH TO Z(S/C)
0418          RTB          DETERMINE IF ROLLOUT
0419 REF 1          37,2122  77634 0          RLTS      IS COMPLETED
0421          37,2123  70473 0          ATDISPR PUSH COS      CONTINUE COMPUTING TSW
0422          37,2125  77606 1          PUSH          LET R(RAD) = 2*PI*ROLL(REV)
0423          37,2126  72405 0          DMP SL1
0424          37,2127  00017 1          14D
0425          37,2130  14027 1          STOOL 22D          -.5*COS(R)*COS(P)
0426          37,2131  77676 0          DCOMP
0427          37,2132  00023 0          STORE 16D          -.5*COS(R)
0428          37,2133  72405 0          DMP SL1
0429          37,2134  00013 0          10D
0430          37,2135  14033 1          STOOL 26D          -.5*COS(R)*SIN(P)
0431          37,2136  41556 1          SIN PUSH
0432          37,2137  00031 0          STORE 24D          .5*SIN(R)
0433          37,2140  72405 0          DMP SL1
0434          37,2141  00017 1          14D
0435          37,2142  14021 1          STOOL 16D          -.5*SIN(R)*COS(P)
0436          37,2143  77676 0          DCOMP
0437          37,2144  72405 0          DMP SL1
0438          37,2145  00013 0          10D
0439          37,2146  24025 0          STOVL 20D          -.5*SIN(R)*SIN(P)
0440          37,2147  00013 0          10D

A0441          FROM TSW FIND THE HALF UNIT VECTORS XDC,YDC,ZDC = INPUT TO CALCGTA
0442          UNIT
0443 REF 3 LAST 93 37,2150  77656 1          STOVL XDC          XDC = .5*UNIT(SIN(P),0,-COS(P))
0444          37,2151  26714 1          16D
0445          37,2152  00021 1          UNIT
0446 REF 3 LAST 93 37,2153  77656 1          STOVL YDC          YDC = .5*UNIT(-SIN(R)*COS(P),-COS(R),
0447          37,2154  26722 1          22D          -SIN(R)*SIN(P))
0448          37,2155  00027 1          UNIT
0449 REF 3 LAST 93 37,2156  77656 1          STOVL ZDC          ZDC = .5*UNIT(-COS(R)*COS(P),SIN(R),
0450 REF 2 LAST 444 37,2157  36730 0          STCALL CALCGTA          -COS(R)*SIN(P))
0451          37,2160  47140 1

A0451          CALL CALCGTA TO COMPUTE DESIRED SM ORIENTATION OCC,IGC,AND MCC
A0452
A0453          FIND DIFFERENCE VECTOR DELTACDU = OCC-CDUX

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A04531

ENTER HERE IF ATTITUDE HOLD

0454				37,2161	41575 0	NOPOLYM	VLOAD	PUSH	OGC	IGC
0455	REF	15	LAST	526	37,2162	02760 1		OGC	CHANGE IGC TO MGC FOR COMPATIBILITY	
0456					37,2163	45006 0		PUSH	MGC	OGC
0457	REF	2	LAST	497	37,2164	47432 1		CDUTR1G	WITH Y,Z,X ORDER OF CDUSPOT	
0458					37,2165	47175 1		VLOAD	RTB	
0459					37,2166	00003 1		2	DPH1	OGC-CDUX , PD4
0460	REF	3	LAST	407	37,2167	45547 0		V1STO2S	DELTA CDU = DTHETA = IGC-CDUX , 0	
0461	REF	1			37,2170	27317 1		STOVL	BOOSTEMP	DPSI
0462	REF	7	LAST	533	37,2171	15332 1		ZEROVECS	MGC-CDUZ , 2	
0463					37,2172	24001 0		STOVL	0	
0464	REF	5	LAST	447	37,2173	00767 1		CDUSPOT		
0465					37,2174	47034 0		RTB	RTB	
0466	REF	4	LAST	535	37,2175	45547 0		V1STO2S		
0467	REF	1			37,2176	70453 1		DELSTOR		
0468					37,2177	14013 0		STOVL	10D	
0469	REF	1			37,2200	00741 0		SINCDUZ		
0470					37,2201	72405 0		DMP	SL1	
0471					37,2202	00001 0		0		
0472					37,2203	60415 1		DAD	SR2	CHANGE SCALE OF AK TO 2REVS
0473					37,2204	00005 1		4		
0474					37,2205	77650 1		GOTO		
0475	REF	1			37,2206	70366 0		ATTIDISP2		
0476	REF	2	LAST	526	34,2000			SETLOC	P11ONE	
0477					34,2366			BANK		
0478	REF	2	LAST	526 TO 533'	244	244*		COUNT	34/P11	
0479					34,2366	14021 1	ATTIDISP2	STOVL	16D	16D, .5(DPH1 + DTHETA*SIN(CDUZ))
0480	REF	1			34,2367	00747 0		COSCDUZ		
0481					34,2370	41405 0		DMP	PUSH	
0482					34,2371	00001 0		0		
0483					34,2372	72405 0		DMP	SL1	
0484	REF	1			34,2373	00751 1		COSCDUX		
0485					34,2374	41325 0		PDDL	DMP	
0486	REF	1			34,2375	00743 1		SINCDUX		
0487					34,2376	00003 1		2		
0488					34,2377	72415 1		DAD	SL1	
0489					34,2400	77626 0		STADR		
0490					34,2401	63755 0		STOVL	17D	17D, .5(DTHETA*COS(CDUX)*COS(CDUZ) + DPSI*SIN(CDUX))
0491					34,2402	72405 0		DMP	SL1	
0492	REF	2	LAST	535	34,2403	00743 1		SINCDUX		
0493					34,2404	41325 0		PDDL	DMP	
0494	REF	2	LAST	535	34,2405	00751 1		COSCDUX		
0495					34,2406	00003 1		2		
0496					34,2407	72425 1		DSU	SL1	
0497					34,2410	77626 0		STADR		
0498					34,2411	77754 1		STORE	18D	18D, .5(-DTHETA*SIN(CDUX)*COS(CDUZ) + DPSI*COS(CDUX))
0499					34,2412	77751 1		TLOAD		



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0500 34,2413 00021 1 16D
0501 REF 9 LAST 244 34,2414 03077 1 STORE AK STORE ATTITUDE ERRORS IN AK,AK1,AK2
0502 34,2415 77776 1 EXIT

A0503

DISPLAY ATTITUDE ERRORS ON FDI1 VIA NEEDLER

0504 REF 116 LAST 531 34,2416 0 4555 0 SATOUT TC BANKCALL
0505 REF 2 LAST 531 34,2417 42404 1 CADR NEEDLER
0506 REF 2 LAST 346 34,2420 3 4113 0 ATERTSET CAP OCT31 DELAY .25 SEC
0507 REF 119 LAST 536 34,2421 0 4555 0 TC BANKCALL EXECUTION + DELAY =.56SEC APPROX
0508 REF 6 LAST 511 34,2422 01732 0 CADR DELAYJOB
0509 REF 2 LAST 531 34,2423 0 2326 1 TC ATERTJOB END OF ATT ERROR DISPLAY CYCLE

0510 REF 31 LAST 474 34,2424 4 4705 0 SATCLEAR CS BITB
0511 34,2425 0 0006 1 EXTEND
0512 REF 24 LAST 360 34,2426 03 012 1 WAND CHAN12 CLEAR IMU ERROR COUNTER
0513 REF 26 LAST 529 34,2427 0 5301 0 TC PHASCHNG TURN OFF PROTECTION
0514 34,2430 00004 0 OCT 00004 FOR ATTITUDE ERROR DISPLAY
05141 REF 116 LAST 533 34,2431 3 4714 1 CAP ZERO
05142 REF 10 LAST 536 34,2432 55=476 1 TS AK ZERO OUT
05143 REF 1 34,2433 55=477 0 TS AK1 AKS FOR
05144 REF 1 34,2434 55=500 1 TS AK2 DOWNLINK
0515 REF 65 LAST 530 34,2435 0 5112 0 TC ENDOPJOB

0516 34,2436 51575 1 S11.1 VLOAD ABVAL
0517 REF 7 LAST 510 34,2437 01177 1 VN
0518 REF 5 LAST 276 34,2440 27723 1 STOVL VMAGI VI SCALED 2(7) IN METERS/CSEC
0519 REF 7 LAST 510 34,2441 01171 1 RN
0520 34,2442 45246 0 ABVAL DSJ
0521 REF 4 LAST 510 34,2443 05311 1 RPAD
0522 REF 3 LAST 275 34,2444 27735 0 STOVL ALTI H SCALED 2(29) IN METERS
0523 REF 6 LAST 536 34,2445 01171 1 RN
0524 34,2446 50256 0 UNIT DOT
0525 REF 6 LAST 536 34,2447 01177 1 VN
0526 34,2450 77752 1 SL1
0527 REF 2 LAST 275 34,2451 03737 1 STORE HDOT HDOT SCALED 2(7) IN METERS/CSEC
0528 34,2452 77616 0 RVQ
0529 REF 2 LAST 535 34,2453 3 1716 0 DELSTOR CA BOOSTEMP
0530 34,2454 0 0006 1 EXTEND STORE DELTACDU INTO PDL 0,2,4
0531 REF 241 LAST 533 34,2455 20 154 0 MSJ MPAC
0532 REF 6 LAST 501 34,2456 50 120 1 INDEX FIXLOC
0533 34,2457 54 000 0 TS 0
0534 REF 3 LAST 536 34,2460 3 1717 1 CA BOOSTEMP +1
0535 34,2461 0 0006 1 EXTEND
0536 REF 242 LAST 536 34,2462 20 155 1 MSJ MPAC +1
0537 REF 7 LAST 536 34,2463 50 120 1 INDEX FIXLOC
0538 34,2464 54 002 1 TS 2
0539 REF 4 LAST 536 34,2465 3 1720 0 CA BOOSTEMP +2
0540 34,2466 0 0006 1 EXTEND
0541 REF 243 LAST 536 34,2467 20 156 1 MSJ MPAC +2



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0542	REP	8	LAST	536	34,2470	50 120 1	INDEX	FIXLOC	
0543					34,2471	54 004 1	TS	4	
0544	REP	2	LAST	280	34,2472	1 6030 0	TCF	DANZIG	
0545	REP	244	LAST	536	34,2473	3 0154 1	CA	MPAC	DETERMINE IF ROLLOUT
05451					34,2474	0 0008 1	EXTEND		IS COMPLETED
05452	REP	5	LAST	534	34,2475	7 1701 1	MP	SATRLRT +1	
05453					34,2476	0 0008 1	EXTEND		
05454	REP	3	LAST	537	34,2477	6 6030 1	BZMP	DANZIG	UNLIKE SIGNS STILL ROLLING
0546					34,2500	0 0008 1	EXTEND		ROLLOUT COMPLETED
05461	REP	1			34,2501	3 3561 0	DCA	MEDYTCTL +2	ZERO OUT ROLL CONTRIBUTION
05462	REP	245	LAST	537	34,2502	52 155 1	DXCH	MPAC	
05463	REP	4	LAST	537	34,2503	0 6030 1	TC	DANZIG	
05464	REP	71	LAST	533	34,2504	0 6008 1	NOPLY	TC	COMES HERE IF
05465					34,2505	52001 1	SETPD	GOTO	ATTITUDE HOLD
05466					34,2506	00001 0		0	
05467	REP	1			34,2507	76161 0		NOPOLYM	
0547	REP	1			34,2510	01873 1	COEPPOLY	ADRES	POLYLOC
0548					34,2511	01476 0	V06N62	VN	0662

R0552 SATURN TAKEOVER FUNCTION

R0553 *****

R0554 PROGRAM DESCRIPTION

R0555 MOD NUMBER 1
R0556 MOD BY ELIASSEN

R0557 FUNCTIONAL DESCRIPTION

R0556 DURING THE COASTING PHASE OF SIVR ATTACHED, THE
R0559 ASTRONAUT MAY REQUEST SATURN TAKEOVER THROUGH
R0560 EXTENDED VERB 46 (BITS 13,14 OF DAPDATR1 SET).
R0561 THE CMC REGARDS RHC COMMANDS AS BODY-AXES RATE
R0562 COMMANDS AND IT TRANSMITS THESE TO SATURN AS DC
R0563 VOLTAGES. THE VALUE OF THE CONSTANT RATE COMMAND
R0564 IS 0.5 DEG/SEC. AN ABSENCE OF RHC ACTIVITY RE-
R0565 SULTS IN A ZERO RATE COMMAND.

R0566 THE PDAT ERROR NEEDLES WILL INDICATE THE VALUE
R0567 OF THE RATE COMMAND.

R0568 CALLING SEQUENCE

R0569 DAPFIG +9D TC POSTJUMP
R0570 CADR SATSIKON

R0571 SUBROUTINES CALLED

R0572 ENDEXT
R0573 IBKCALL
R0574 STICKCHK



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R0575 NEEDLER
R0578 TSURPT
R0577 RESUME.

R0578 ASTRONAUT REQUESTS

R0579 ENTRY - VERB 46 ENTER
R0580 (CONDITION - BITS 13, 14 OF DAPDATR1 SET)

R0581 EXIT - VERB 48 ENTER (FLASH V08N48)
R0582 VERB 21 ENTER AXXXX ENTER WHERE A=0 OR 1
R0583 VERB 34 ENTER
R0584 VERB 46 ENTER

R0585 NORMAL EXIT MODE

R0586 VERB 46 ENTER (SEE ASTRONAUT ABOVE)

R0587 ALARM OR ABORT EXIT MODES

R0588 NONE

R0589 OUTPUT

R0590 SATURN RATES IN CDUXCMD, CDUYCMD, CDUZCMD

R0591 ERASABLE INITIALIZATION

R0592 DAPDATR1 (BITS 13,14 MUST BE SET)

R0593 DEBRIS

R0594 CENTRALS
R0595 CDUXCMD, CDUYCMD, CDUZCMD

0598				43,3211		BANK 43
0597	REP	3	LAST	248	43,2000	SETLOC EXTVERBS
0598					43,3211	BANK
0599	REP	1				COUNT 23/STRIKE
0800					43,3211	0 0006 1 SATSTICK EXTEND
08001	REP	1			43,3212	3 3227 0 DCA 2REDOSAT
08002					43,3213	0 0004 0 INHINT
08003	REP	5	LAST	255	43,3214	53 313 0 DXCH TSLOC
08004	REP	12	LAST	424	43,3215	3 4672 0 CAP POSMAX
0801	REP	3	LAST	188	43,3216	54 030 0 TS TIMES
08011	REP	11	LAST	532	43,3217	4 0102 0 CS FLAGWRD6
08012	REP	2	LAST	130	43,3220	7 4105 0 MASK RELTAB11
08013	REP	12	LAST	538	43,3221	26 102 0 ADS FLAGWRD6
080132	REP	21	LAST	531	43,3222	0 4833 0 TC 1RNCALL

TURN ON BITS 15,14 OF
FLAGWRD6
SATSTICK CONTROL OF TS
ZERO JET CHANNELS IN 14 MS AND THEN



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060134 REP 1 43,3223 42616 0 CADR ZEROJET
06014 43,3224 0 0003 1 RELINT
06015 REP 27 LAST 261 43,3225 0 2121 1 TC GOPIN

060151 REP 7 LAST 531 E6,1704 EBANK= BODY3
06016 REP 2 LAST 166 43,3226 02765 1 2REDOSAT 2CADR REDOSAT
06016 43,3227 46106 1

LEAVE THE TS CLOCK DISABLED
EXIT THUS BECAUSE WE CAME VIA V46

060162 32,2017 BANK 32
060164 REP 1 23,2000 SETLOC P11FOUR
060166 23,2765 BANK

0602 REP 3 LAST 219 23,2765 22 016 0 REDOSAT LXCH BANKRUPT
06021 23,2766 0 0006 1 EXTEND
06022 REP 3 LAST 219 23,2767 22 012 1 QXCH CRUPT
06023 REP 6 LAST 531 23,2770 4 1501 0 CS RCSFLAGS
06024 REP 16 LAST 531 23,2771 7 4710 1 MASK BIT3
06025 REP 9 LAST 539 23,2772 27=501 0 ADS RCSFLAGS
0603 REP 22 LAST 536 23,2773 0 4633 0 TC IRNKCALL
0604 REP 3 LAST 536 23,2774 42404 1 CADR NEEDLER
0605 REP 16 LAST 251 23,2775 3 4702 0 CAP BIT9
0606 23,2776 0 0006 1 EXTEND
0607 REP 25 LAST 536 23,2777 05 012 1 WOR CHAN12
0608 23,3000 0 0006 1 EXTEND
0609 REP 1 23,3001 3 3046 0 DCA 2SATSTCK
0610 REP 6 LAST 538 23,3002 53=313 0 DXCH TSLOC
0611 REP 1 23,3003 3 3044 1 CAP 100MST5
0612 REP 4 LAST 536 23,3004 54 030 0 TS TIME5
0613 REP 25 LAST 226 23,3005 1 5222 1 TCF RESUME

ALSO COMES HERE FOR RESTARTS

TURN ON BIT3 OF RCSFLAGX
FOR
NEEDLER INITIALIZATION

DISABLE IMU ERR COUNTERS ETC.
SIVB
TAKEOVER
ENABLE
SET UP TS CYCLE

IN 100 MSEC5

END OF SATURN STICK INITIALIZATION

A0614

THIS SECTION IS EXECUTED EVERY 100 MSEC5

0615 REP 4 LAST 539 23,3006 22 016 0 SATSTICK LXCH BANKRUPT
0616 23,3007 0 0006 1 EXTEND
0617 REP 4 LAST 539 23,3010 22 012 1 QXCH CRUPT

0618 REP 2 LAST 539 23,3011 3 3045 0 CAP 2SATSTCK
0619 REP 7 LAST 539 23,3012 55=312 1 TS TSLOC
0620 REP 2 LAST 539 23,3013 3 3044 1 CAP 100MST5
0621 REP 5 LAST 539 23,3014 54 030 0 TS TIME5
0622 REP 1 23,3015 3 3043 0 CAP STICKBITS
0623 23,3016 0 0006 1 EXTEND
0624 REP 2 LAST 364 23,3017 06 031 0 RXOR CHAN31
0625 REP 2 LAST 539 23,3020 7 3043 1 MASK STICKBITS
0626 REP 23 LAST 539 23,3021 0 4633 0 TC IRNKCALL
0627 REP 1 23,3022 43114 1 CADR STICKCHK

0628 REP 2 LAST 108 23,3023 51=656 0 INDEX RMANNDX
0629 REP 1 23,3024 3 3037 0 CA SATRATE
0630 REP 11 LAST 536 23,3025 55=476 1 TS AK

SET UP RUPT
LO ORDER LOC SET
100 MSEC5

CHECK IF MAN ROT BITS SAME

SET RATE INDICES
FOR PITCH YAW AND ROLL

SET SATURN RATES

ROLL



L P11

USER'S PAGE NO. 17 E6 S4

0631	REP	2	LAST	108	23,3028	51=657 1	INDEX	FRANKDX
0632	REP	2	LAST	539	23,3027	3 3037 0	CA	SATRATE
0633	REP	2	LAST	538	23,3030	55=477 0	TS	AK1
0634	REP	2	LAST	112	23,3031	51=680 0	INDEX	YMANNDX
0635	REP	3	LAST	540	23,3032	3 3037 0	CA	SATRATE
0636	REP	2	LAST	538	23,3033	55=500 1	TS	AK2
0637	REP	24	LAST	539	23,3034	0 4633 0	TC	TRKCALL
0638	REP	4	LAST	539	23,3035	42404 1	CADR	NEEDLER
0639	REP	26	LAST	539	23,3036	1 5222 1	TCF	RESUME
0640					23,3037	00000 1	SATRATE	DEC 0
0641					23,3040	00478 1	DEC	+318
0642					23,3041	77301 0	DEC	-318
0643					23,3042	00000 1	DEC	0
0644					23,3043	00077 1	STICKBITS	OCT 00077
0645					23,3044	37766 1	100VST5	DEC 16374
0646	REP	6	LAST	539	E6,1704		EBANK=	BODY3
0647	REP	1			23,3045	03008 1	2SATSTICK	2CADR SATSTICK
0647	REP	1			23,3046	46106 1		

PITCH

YAW

FOR SATURN INTERFACE AND FDI DISPLAY

END OF SATURN STICK CONTROL
IN DETENT - ZERO RATE
POS RATE .5D/S R, .3D/S P AND Y
NEG RATE DITTO
POS NEG BITS ON ASSUME IN DETENT